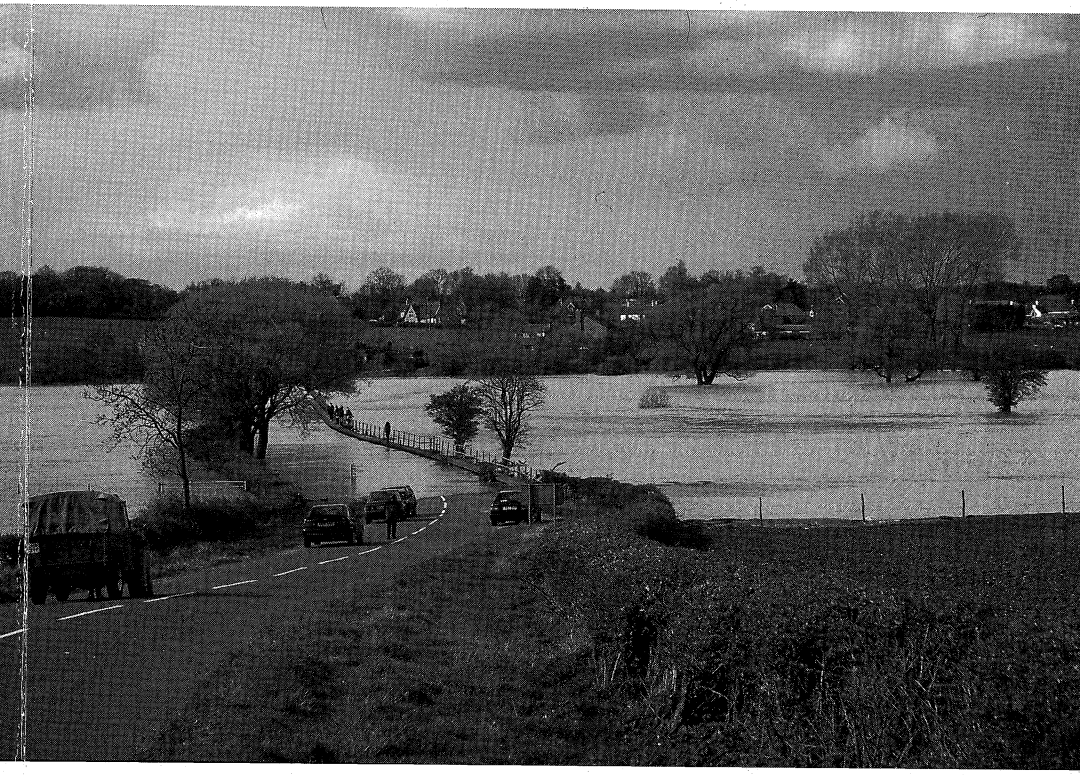
The Bedfordshire Naturalist 53 (Part 1)

Journal for the year 1998



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THE BEDFORDSHIRE NATURALIST

The Bedfordshire Naturalist is the official Journal of the Bedfordshire Natural History Society, a body which has been a prime contributor to botanical and zoological knowledge of the county. Published since 1946, the Journal is noted for its original papers on all aspects of natural history, especially distribution, status, population, habitat and field ecology. It caters for the professional and amateur alike and aims for the middle ground.

The Journal is published in two parts; Part 1 comprises meteorology, geology and all aspects of natural history excluding birds. Part 2 comprises the annual bird report and all articles relating to birds.

Relevant papers on the natural history of the county are welcomed. Guidelines are obtainable from the Editor who will be pleased to discuss inclusion of any articles.

Contact: Rosemary Brind, Honorary Editor, Bedfordshire Naturalist, BNHS c/o Bedford Museum, Castle Lane, Bedford MK40 3XD

LIST OF COLOUR PLATES

Front cover : The Easter rains of 1998 caused extensive flooding along the length of the floodplain of the River Ouse. Looking north across the flooded bridge at Radwell. *Richard Revels*

THE BEDFORDSHIRE NATURALIST
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Edited by R.A.Brind
Photographic Editor : R.C.Revels

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Bryophytes and Fungi
Alan Outen, our Recorder for both Bryophytes and Fungi, has been suffering from severe back problems over the last 18 months and has not been able to compile the reports for 1998. He hopes to put in a two year report in the next journal.

The Bedfordshire Bird Report for 1998 is published separately as Part 2 of the *Bedfordshire Naturalist.*

The Society would like to thank Bedford Borough Council and Bedfordshire County Council for grants towards publication of the Journal.

METEOROLOGY
by Mike Williams

Overview

The main feature of 1998 was its wetness. While only seven months were wetter than normal, the year as a whole saw 38% more rainfall than average with April, June, September and October being particularly wet. Despite that the year was warmer than normal, but not as warm as in 1997. However, only one month saw average temperatures below normal. Sunshine was very close to normal.

The wettest month of all was April with well over three times April's normal rainfall. The majority of this (45mm) fell on the 8th and the 9th resulting in widespread flooding across the Midlands, including north Bedfordshire along the River Great Ouse. As well as being wet the weather was also cold during this period.

June was another very wet month, nearly twice as wet as usual, with less sunshine but near normal temperatures. In contrast the other two summer months were somewhat warmer than usual, quite dry (50% of normal rainfall) and slightly sunnier than usual. In fact, though perhaps contrasting with the popular impression, the summer of 1998 was very typical of an English summer, but disappointing after the warmth of recent years.

The whole of the autumn period was wet and rather cloudy, but November apart still on the mild side. The River Great Ouse was in flood on many occasions, but never at danger levels. November produced an early fall of snow which carpeted the ground in the south of the county on the morning of the 14th. However, in both winter periods the frequency of frost was much reduced (35 nights in 1998 compared with 53 in 1997, a warmer year).

Unless otherwise stated all references to figures are from the data for Silsoe College.

January

The year commenced with temperatures near or a little above average, much cloud, rain and strong winds, as vigorous depressions moved from west to east. On the 3rd heavy showers of rain, hail and sleet occurred between Clophill and Silsoe with one huge flash of lightening, but it was completely dry in Barton. There was another short but sharp fall of pea-sized hail, this time in Barton, on the 7th accompanied by up to ten sharp claps of thunder. The ground was covered and the hail did not finally melt till evening.

After the first week, with mostly westerly winds, the airflow changed to be more from the south-west or south with correspondingly higher temperatures, but much less rain. For ten days the daily maximum reached or exceeded 10°C (50°F). From mid month onwards high pressure exerted more influence and frost was recorded on a number of nights, and with correspondingly lower temperatures by day. However, the weather could be described only as 'rather cold' at worst. Overall sunshine was very much average for January, though the sunniest days were also the mildest days, not often the case in the winter months. Rainfall was 16% above average due to a particularly wet first week.

February

The month was exceptionally mild and sunny, and very dry. On 13th a maximum of 19°C (66.2°F) was recorded at Silsoe on a day with 8.2 hours of sunshine. Several days in this period were more like April or even May than mid-winter. Generally dry and mild weather persisted throughout the rest of the month, though not always as sunny as in the first two weeks. The mean maximum temperature for the month was 5.2°C above normal, and the amount of sunshine nearly double the February average. Rainfall was 25% of normal. It is thought likely to have been the warmest February this century.

March

For the first week the weather continued as in February, but noticeably wetter. There then followed a week of colder weather with some frost at night before milder weather returned and persisted for the remainder of the month. The last week was particularly mild, but without reaching the extremes of February. The middle part of the month was dry, but overall rainfall was still above average with sunshine below normal.

April

In 1998 April proved to be an exceptional month with 3½ times the average monthly rainfall, and 25% of that falling on two consecutive days. Despite this Bedfordshire was spared the worst ravages of floods which wreaked havoc in Northampton. The first week was blustery, with frequent showers most days and temperatures above normal in the westerly winds. From the 8th to the 10th a small depression was slow moving over southern Britain as cold northerly winds pushed down over Scotland and northern England. On the 9th there was continuous heavy rain with very dark clouds, thunder and lightening, weather which affected a large part of the South Midlands. Locally, in Barton, it was so dark that the external security lights fitted to houses came on. The day started with general rain and drizzle accompanied by thunder and lightening (and several short power cuts). From 9am there was a period of torrential rain and hail, with drifts of hail up to 5cm deep. From 9.30am the weather brightened a little, but the rain continued with intermittent hail, thunder and lightening, until a clearance began late afternoon.

The length of the Great Ouse means that the highest water levels often occur days after the heaviest rainfall, and it was not until Saturday 11th April that a red alert was issued by the Environmental Agency for this river. One of the worst affected areas in Bedfordshire was Clapham, north of Bedford, where most of the High Street was inundated on Saturday morning, but had subsided by the following day. Despite the undoubted devastation to property, water levels inside houses were only 6 inches or so according to reports in local newspapers. Low lying areas of Bedford town, particularly along the Embankment and in Kempston, were also affected by flood water. Despite the havoc and disruption to road traffic caused by the floods, the situation on the River Great Ouse never approached the seriousness of the River Nene through Northampton where the effects of flooding were still causing gross inconvenience for some residents twelve months later. Bedfordshire may have seemed to have escaped comparatively lightly in the end. However, Tony Smith (who lives at Carlton, near

the River Great Ouse) commented, "Between 5th and 10th April 50mm of of rain fell causing the highest flooding of the River Ouse since living here from 1967. We are only three fields from the river here and on the edge of its flood plain. I believe it caused much death and destruction to mammals, birds and insects. Records of the latter, particularly moths, were much down in numbers."

On its course through Bedfordshire the Great Ouse is often surrounded by a low-lying flood plain, and while this land may well have been drained over the last hundred years still has the capacity to act as a huge reservoir when needed, drawing off the worst effects of any flood. In addition, the length of the river means that water levels rise (and fall) more slowly and over a longer period of time than shorter and narrower waterways which are more vulnerable to flash floods. The narrower valley of the Nene through Northampton and the extent to which building has been allowed on its natural flood plain seem to have been contributory causes there. One hopes that the lessons learned will also influence planners, developers and land-owners in Bedfordshire in ensuring that the Great Ouse can continue to perform its life-saving role.

During the cold spell which followed the deluge snow occurred in some showers and there was even a dusting of snow on the ground in places on the morning of 14th April. In the second half of the month temperatures recovered to be mostly above average but there was rain on most days. This gave a staggering total of 136mm for the month as a whole, about 18% of the year's total from what is usually one of the driest months of the year.

May

In contrast May brought a taste of summer with warm sunny days and little rainfall for much of the month (though torrential rain in Hemel Hempstead on the 14th moved north-west and affected Leighton Buzzard, though the rest of Bedfordshire escaped). The warmest periods were the 8th & 9th, from the 13th to 20th, and the 30th & 31st. In all these periods daytime temperatures exceeded 20°C. The warmest day was the 15th with a temperature of 23.8°C (75°F). The nights were also relatively warm, with a complete absence of any significant late frosts.

June

June, a prime month for many species, was another very wet month, and in consequence quite cloudy though temperatures were near normal. The rainfall was spread throughout the month, though the 11th was a singularly wet day. The pattern of the month's weather was determined by a series of small depressions which crossed the country from west to east. The third week was the warmest with a maximum temperature of 26.0°C (78.8°F). This was one of the very few totally dry days this June. Overall the total rainfall was nearly twice the monthly average, and following the exceptionally wet April provided yet another challenge to the county's wildlife.

A freak weather event occurred in Bromham on the 12th June, and was photographed and described by Peter Almond. Heavy rain and then hail turned the ground white, while holes were punched in the leaves of plants. According to Peter remnants of the hail were clearly visible the following morning.

July

If the first real summer month had proved a disappointment, July did a little to make amends. Temperatures were very close to normal as was sunshine, and precipitation was little more than half what might be expected. The first week was very dry but not particularly warm in the predominantly northerly winds. The second week was more changeable with winds more westerly. For the remainder of the month high pressure was often to the south-west of Britain but seldom close enough to produce any really warm spells. The warmest days were the 16th (26.2°C) and the 20th (26.5°C).

August

August was another dry month, and as it was nearly 60% of the month's rainfall fell on just one day, the 23rd. Otherwise there were many dry days and it was a sunny month. It was also on the warm side, particularly in the first two weeks with highs of 29.8°C on the 10th, and 29.5°C on the 11th. Indeed, from the 5th to the 11th the daytime maximum exceeded 25°C every day. Overall, despite press comment to the contrary, the summer of 1998 was warmer than average, even if by only a modest amount, but perhaps disappointing for those who expected recent summers to be a more permanent feature of our climate.

September

This month can seem to be a continuation of summer, or a quick reminder that autumn and then winter is on its way. In 1998 the message was mixed. It was certainly another very wet month with more than 2½ times the average amount of rainfall, yet it was rather warm with sunshine close to average. The first twelve days were generally wet, with four particularly wet days during this period. There followed a drier interlude, initially cooler, before the weather turned milder again and ultimately wet with around 45mm falling over 26th/27th caused by a depression moving up the English Channel.

October

In 1998 October was yet another very wet month with more than twice the average rainfall. Many parts of the country were affected, and the River Severn was badly affected by flooding. Temperatures were moderate throughout, and the first ground frost occurred mid-month, but nothing worse. There were three very wet days, on the 16th, the 27th and again on the 31st. Despite all the rain and cloud, sunshine was near normal; much of the rain in the first half of the month fell at night, while in the second half it was generally showery rather than longer periods of rain.

November

November maintained the wet theme for the autumn, with precipitation up 36% on the average. It was generally cold, particularly from 13th to 25th with air frost on six nights. On the morning of the 14th there was about 1cm of frozen, melted snow lying in Barton, but I am told none in Bedford, and from my own observations the snow rapidly petered out south of Luton.

December

With the approach of winter the weather initially maintained the rather cold and mostly dry conditions of late November, and air frost occurred on several nights. From the 8th to the 19th the weather was rather mild, particularly so from 11th to 14th, and it was wetter during this period. After a few colder days it turned milder again over the Christmas period and remained near or a little above average to the month's end. Christmas day was quite wet. It was also very windy overnight from 26th to 27th, but the main damage and effects were felt only in northern England and Scotland. It was also a month of little sunshine, and yet again above average rainfall.

Summary

Over the year as a whole, temperatures were around 1.3°C above normal, sunshine was very close to average, but rainfall up by 38%. At Silsoe, 757.6mm of precipitation was recorded in 1998 compared with 499.3mm in 1997. In consequence ground water levels were restored to near their normal levels by the year end.

Acknowledgements

I am grateful for the supply of weather data from Silsoe College, but I would also like to thank Tony Aldhous (Potton), Peter Almond (Bromham), Angela Bucknall (Cranfield), Betty Chambers (Meppershall), Errol Newman (Goldington) and Tony Smith (Carlton) for the provision of data and/or descriptions relating to the county's weather. Even in a small county the weather varies enormously, and these differences can only be recorded if the Society's members contribute.

	Mean Maximum °C	Mean Minimum °C	Highest Temp. °C	Lowest Temp. °C	Rainfall mm	Sunshine hours	Air Frost days
January	8.2 (+2.2)	2.5 (+1.9)	14.5	-4.0	53.0 (116%)	1.7 (100%)	8
February	11.7 (+5.2)	3.3 (+2.8)	19.0	-6.2	9.0 (25%)	4.3 (185%)	5
March	11.8 (+2.4)	4.5 (+2.9)	16.9	-5.0	46.7 (119%)	2.6 (72%)	4
April	12.2 (-0.2)	4.6 (+1.0)	20.6	-1.2	136.0 (353%)	4.2 (89%)	3
May	18.6 (+2.5)	7.9 (+1.6)	23.8	0.3	12.6 (31%)	6.4 (103%)	-
June	19.3 (0.0)	10.7 (+1.7)	26.0	2.7	91.0 (185%)	5.1 (76%)	-
July	21.1 (+0.1)	11.8 (+0.7)	26.5	6.4	28.1 (58%)	5.6 (95%)	-
August	22.6 (+1.8)	10.5 (-0.4)	29.8	6.0	26.2 (44%)	7.3 (133%)	-
September	19.9 (+1.5)	10.9 (+1.8)	24.7	6.0	120.5 (269%)	4.5 (93%)	-
October	14.4 (-0.0)	7.8 (+1.3)	18.3	0.5	101.7 (217%)	3.3 (97%)	-
November	8.8 (-0.6)	2.5 (-0.7)	16.5	-3.2	68.8 (136%)	2.1 (99%)	7
December	9.0 (+1.8)	2.7 (+1.1)	14.7	-3.2	64.0 (125%)	1.1 (69%)	8
Year	**14.8 (+1.4)**	**6.6 (+1.3)**	**29.8**	**-6.2**	**757.6 (138%)**	**4.0 (99%)**	**35**

Table 1. Weather data for 1998 as recorded at Silsoe College

Mike Williams is the Society's Recorder for Meteorology, a position he has held in an honorary capacity since 1981.

GEOLOGY AND PALAEONTOLOGY
by Peter Smart

The most interesting and important discovery made during the year was a Jurassic pliosaur discovered and excavated by Mr Chris Andrew, Keeper of Natural History at Bedford Museum.The specimen,determined as *Peloneustes philarchus* (Seeley), occurred in the Lower Oxford Clay exposed in the Hanson Brick (formerly London Brick Co.) Quest quarry near Kempston Hardwick (around TL035425).

Marine reptiles are usually represented in the Bedfordshire Jurassic and Cretaceous clays by isolated teeth and bones, such fossils being not uncommon at some horizons. Articulated remains are, however, very rare and Mr Andrew is to be congratulated in not only being in the right place at the right time while the specimen was visible, but in his patience and tenacity in following this up and excavating the numerous bones and hundreds of fragments scattered around and buried in the matrix. To excavate such material, particularly during the winter months in extremely cold and wet conditions, is no mean task and his work was far from complete by the end of the year. A preview of the skeleton by the writer while this report was being prepared was extremely impressive, the bones being assembled on a large bench at the museum, and at the time of writing possibly some 90% of the pliosaur had been recovered. *P. philarchus* is one of the smaller pliosaurs found in the Lower Oxford Clay, the specimen in the museum being between 3 and 4 metres in length. It is understood that when completed it will form part of a permanent display, so perhaps it is fortunate that Mr Andrew did not happen upon one of the larger pliosaurs that also occur in the Lower Oxford Clay such as *Liopleurodon ferox*, that can exceed 16 metres in length. He would have needed not only a larger bench but a larger museum.

To proceed further with regard to the *Peloneustes* in this annual report is inappropriate, such a specimen warranting a descriptive account. Mr Andrew has agreed to prepare this as a paper, hopefully in time for the 1999 journal.

In contrast, the Cretaceous sections in the south of the county produced few records. Much of the Recorder's available time this year was spent at the Natural History Museum researching Cretaceous shark material from Kent, the Bedfordshire Cretaceous studies suffering as a result. Nevertheless, no sections were neglected, but fewer visits were made with some solely for the purpose of keeping abreast of excavating work. The Clophill Fuller's earth quarries were extended westwards as anticipated last year, but only two small phosphatic nodules were obtained. Both were roughly spherical, approximately 10cm in diameter, and unfossiliferous. Several visits were made throughout the year but the new exposures were devoid of the large doggers as in previous years. In addition, sections studied further east and which were always worth regular inspections due to slumping of the sands and marls, thereby revealing new exposures, were allowed to flood prior to landscaping the worked-out areas.The depth of water in most of these early contiguous pits is now considerable and completely covers the nodule-bearing sandy marl beds. The chances of obtaining *Parahoplites nutfieldiensis* Zone ammonites for Dr Casey's monograph revision are becoming increasingly more remote.

The Upper Gault clays of the *Stoliczkaia dispar* Zone in the old Arlesey Brick Works

quarry (TL188348) were inaccessible this year due to excavation works being carried out by Shanks & McEwan Ltd, but some 50m of the overlying Cambridge Greensand and Lower Chalk were studied on the last visit. Interestingly, the only fossil from the Chalk was a second large maxilla tooth of *Protosphyraena ferox* Leidy, found in almost the same spot as the tooth recorded last year. The close proximity of the two teeth strongly suggest that they were associated, as the fish is very rare, but no other teeth or jaw fragments were discovered despite thorough searching and removal of matrix for subsequent washing and sieving.

The Cambridge Greensand, also examined along this same 50m length, yielded a few eroded Gault species all of which had been previously noted. Of particular interest, however, was an isolated tooth of the hexanchid shark *Notorynchus aptiensis* (Pictet) that occurred near the base of the bed among the small, greenish phosphatic nodules. This tooth, a lower jaw anterolateral, is unfortunately incomplete and eroded. This is rather typical of Cambridge Greensand fossils as during late Albian times a local upward movement of the ocean floor brought the top zones of the Upper Gault within the range of marine erosion. The finer silts of the top clays were washed away, and the heavier constituents including fossils were rolled and redeposited (Chatwin 1961). This erosional bed therefore contains very worn fossils, any specimens found in good condition almost certainly being protected by a phosphatic pebble or nodule.

As is fairly typical as regards preservation, therefore, the *Notorynchus aptiensis* tooth exhibits considerable wear due to this rolling among abrasive particles. The root is eroded both mesially and distally with much of the basal portion also missing.

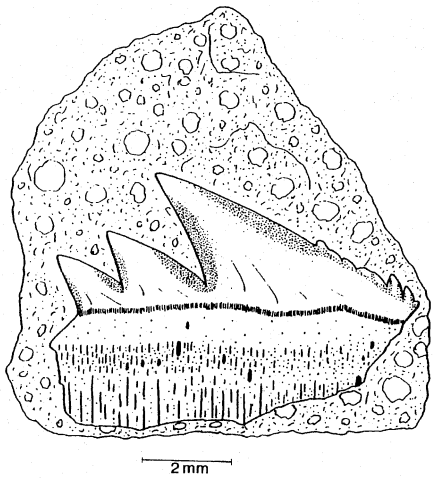

Figure 1. Lower jaw anterolateral tooth of the Lower Cretaceous hexanchid shark *Notorynchus aptiensis* (Pictet).
Incomplete, 3rd, and possibly 4th distal cusp missing, shown in matrix, lingual view.
Lower Cretaceous fauna, Cambridge Greensand, Arlesey Brick Works quarry (Landfill site) near TL188348.

PJS Coll. 15598M

Surprisingly, although one, or at most two, of the distal cusps are missing the remainder of the crown comprising the principal cusp and two large distal cusps is undamaged, only the crest of serrations on the mesial margin of the principal cusp being almost entirely eroded away. The specimen in the matrix as found is illustrated in Figure 1.

This is only the second hexanchid tooth discovered by the Recorder in the Cambridge Greensand of Arlesey Brick Works quarry, the first being a similarly incomplete and badly eroded anterolateral discovered in the same bed, though further west in the earlier workings, in 1954 (Smart 1989). This 1954 specimen was determined at the Geological Survey & Museum, when this was situated next door to the Natural History Museum (the British Museum (Natural History) as it was then), as a tooth of *Hexanchus microdon* (Agassiz), one of the Upper Cretaceous species of hexanchid sharks. This determination was, however, erroneous. Although the Upper Cretaceous Lower Chalk rests upon the Cambridge Greensand at Arlesey, the phosphatic nodules and phosphatised fossils of the Greensand bed are of Lower Cretaceous Upper Albian (Upper Gault *Stoliczkaia dispar* Zone) age eroded and rolled as mentioned earlier. The first tooth therefore is also an anterolateral of the Lower Cretaceous *Notorynchus aptiensis*. This 1954 tooth could not be located in the collection of the British Geological Survey after its move to Keyworth, as the GSM reference number given to the writer at that time is not known, but from memory the specimen was in a poor state, none of the remaining cusps being complete due to abraded apices. It had been hoped that excavations would cease later, thereby allowing access to the Greensand, but plant movement continued into the winter months. All other field work was, therefore, in the Leighton Buzzard area.

Munday's Hill quarry (around SP936279) has degenerated considerably over the past few years, due principally to over-collecting by parties, and it is no longer possible for an individual researcher to make a representative collection of Gault fossils by surface searching. Despite the problems associated with large parties – over 80 at Munday's Hill on one day in December – a few small interesting specimens were obtained over several visits. Being forced to adopt methods which would have been more appropriate for Sherlock Holmes – on hands and knees with a large magnifying glass – two fairly important fish fossils were discovered. The first, a tooth of the hybodont shark *Lissodus levis* (Woodward) was discovered in the Lower Gault of Munday's Hill pit. *L. levis* (Family Hybodontidae) is a Lower Cretaceous member of an extinct group of sharks which are distinguished by fin spines with pointed barbs on the posterior face. Superficially, the tooth crown resembles that of *Heterodontus acutidens* (Woodward) but the root is deep, and the species is very much rarer in the Leighton Buzzard Gault than *H. acutidens*. Three teeth of *L. levis* have been recorded from the Leighton Buzzard district by the Recorder over some 30 years, compared with 28 teeth of *H. acutidens* during the same period. The *L. levis* tooth is shown in Figure 2.

The second specimen of particular interest, found later in the year at Munday's Hill, was a small fragment of a fish braincase discovered in the nodule bed at the base of the Upper Gault *Mortoniceras (Mortoniceras) inflatum* Zone exposed in the new extension to the quarry along the north-east side. This small specimen was later determined at the Natural History Museum as an anterior dorsal fragment of a clupeomorph fish

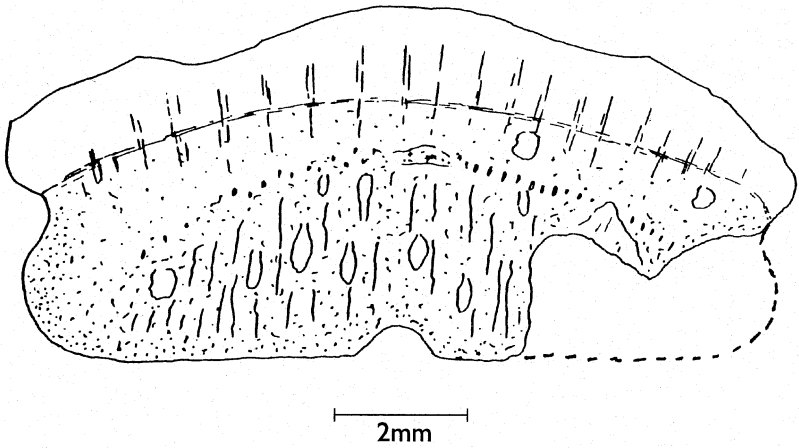

Figure 2
Tooth of the hybodont shark *Lissodus levis* (Woodward). Lower Cretaceous Middle Albian, Lower Gault. *Euhoplites loricatus* Zone, *Anahoplites intermedius* Subzone, Munday's Hill quarry, Leighton Buzzard (near SP936279).

PJS Coll. 15026M.

braincase, possibly *Spratticeps gaultinus* Patterson. Although fragmentary, measuring only 6mm long, 5mm wide and 3.5mm thick, it exhibited the ornamental ridges and pores of the five previously described specimens (Patterson 1970), also of the single braincase discovered by the writer in Munday's Hill quarry (Smart 1995; 1997a). The specimen would undoubtedly have been of interest to Dr Patterson in his work on *Spratticeps*, but sadly he suffered a major heart attack on his way to the Museum and died on 9th March. His unexpected death came as a tremendous shock to everyone who knew him, and the many papers on teleosts – his special field – that he was working on have little hope of completion in the foreseeable future.

Chamberlain's Barn quarry (near SP931264) was studied on several occasions, primarily to examine the Lower Albian Gault – Woburn Sands junction beds. The faunal list of species from the temporary section (Smart 1997b) was not added to, and in fact the junction beds had been much obscured during the year by slumping of the overlying Gault clays. A few *Douvilleiceras* and *Beudanticeras* specimens were excavated out of the accessible sections near the southern end of the eastern side, the only two of note being a well preserved body chamber of *D. alternans* Casey and a fine uncrushed *D. mammillatum* (Schlotheim) in a gritty phosphatic nodule. The overlying Gault clays yielded only a single tooth crown of *Cretolamna woodwardi* Herman and a few indiscriminate whorl fragments of *H. dentatus* Zone ammonites and other various, previously recorded fossils.

Billington Road pit (around SP930241) was more interesting. During the summer the Gault-Woburn Sands junction beds were accessible in part of the new southern extension and yielded several fossils from the gritty phosphatic nodules in Owen's Bed

2 (iv) including a small uncrushed *Leymeriella* sp. and an irregular echinoid determined by Dr Andrew Smith at the NHM as a species of *Hemiaster*. Bed 2 (vii) yielded a small uncrushed *Hoplites dentatus* (J. Sowerby) in a smooth, less pebbly phosphatic nodule. These Beds were first described by Wright & Wright (1947) as Bands II and IV respectively, from exposures further north in the quarry. The *H. dentatus*, although beginning to disintegrate within the nodule, was sent on to Dr Casey, as this species is a Middle Albian ammonite and further confirms his statement that band IV in the junction beds is, in fact, of early *H. dentatus* Zone age and not Lower Albian as are bands I–III (Casey 1961).

The most important specimen from Billington pit, however, was discovered in the basal Gault exposed in the new southern section. This was a rostrum of the teleost fish *Belonostomus* sp., longer than the two rostra previously discovered in the Leighton Buzzard Gault. It measured 36mm in length with 5 teeth (apices missing), the entire specimen being very fragile. A drawing of the rostrum was sent up to Dr Peter Forey of the Department of Palaeontology, the Natural History Museum in November and, subsequent to a request from him for the loan of the material, the rostrum and two earlier specimens were taken up on a visit in December. The first of the three rostra had been discovered and illustrated in the 1991 Journal, and a drawing sent to Dr Colin Patterson the same year. It was this drawing filed among Colin's papers that resulted in Dr Forey's request.

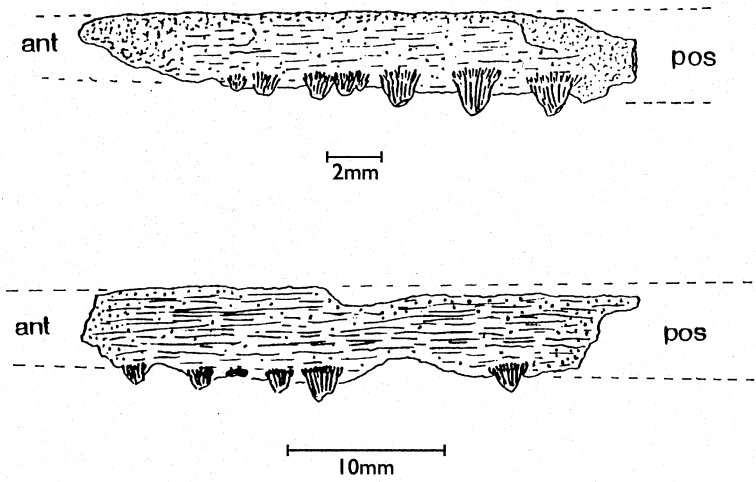

Figure 3. *Belonostomus* sp
Partial rostra from the Middle Albian Lower Gault clay, *Hoplites dentatus* Zone, lower *Hoplites spathi* Subzone. Billington Road (Pratt's) quarry, Leighton Buzzard.
(a) BMNH P. 65225 (Sept.1994) – location SP930237
(b) BMNH P. 65226 (July 1998) – location SP932237
(ant – anterior; pos – posterior)

As no rostra of *Belonostomus* were in the NHM collection of Gault fishes, a photograph of the one showing most detail will be published in the forthcoming "Fossils of the Gault" – a Palaeontological Association publication in the "Fossils of ....." series. The assemblage from Leighton Buzzard was therefore donated to the Museum in its entirety, it being evident that for research purposes such a rare group of rostra should remain a collection.

The three specimens were all obtained from the Lower Cretaceous Middle Albian, Lower Gault *Hoplites dentatus* Zone and are the only known records from the Leighton Buzzard district, being collected over a period of some eight years. The first rostrum, discovered in Munday's Hill quarry in 1991 and illustrated (Smart 1991, p12) under ref. no. PJS coll. 15001M, now becomes BMNH P. 65224. The second, from Billington Road quarry in 1994, is now BMNH P. 65225 and the most recent rostrum, again from Billington Road pit, is BMNH P. 65226. These latter two specimens are illustrated in Figure 3.

To conclude the 1998 Report, Billington Road quarry will continue to warrant close examinations. The Gault thickens eastwards from the new southern extension and the highest beds were noted, on the Recorder's last visit of the year, to contain rare crushed ammonites. Two of these were observed to possess a decaying pyritic outline, not seen in lower beds. This suggests that the uppermost strata may contain a *Euhoplites loricatus* Zone fauna, the *Anahoplites intermedius* Subzone (the basal Subzone) resting upon the *Hoplites spathi* Subzone (the upper part of the *H. dentatus* Zone). Owen (1972 p307) states "Throughout *intermedius* Subzone times sedimentation, chemical conditions did not permit the preservation of calcareous shells. Ammonites are rare and preserved as crushed pyrite-coated clay casts". It was unfortunate that poor weather conditions coupled with the return of the excavating machinery prevented this point being checked, but hopefully the section will become accessible early in 1999.

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MAMMALS
by Cliff Tack

Review of 1998

There was a very good response recording mammals during the year with 31 species recorded in the county by over 90 observers. The fourth year of the mammal distribution survey produced over 500 new tetrad records so that we now have over 3,100 tetrads mapped for 33 species.

There was only one report of an exotic mammal and that was of a Coypu, *Myocastor coypus* (20 years after the last Bedfordshire record) seen near Sandy in January. As Coypu have now been extinct in Britain for over eight years this record must remain as unconfirmed. There have been other reports in recent years near Bedford but they too were unsubstantiated. For the first time since 1991 there were no reports of any Wallaby, *Macropus rufogriseus* in the county.

All the small mammals in Bedfordshire are under recorded, so it was good to have records of all ten species during the year. The three new tetrad records for Yellow-necked Mouse were particularly pleasing. One turned up whilst trapping for the national Yellow-necked Mouse survey, by Leigh Lyle and the other two were found by accident by a contact of Dave Parsons. A good number of new small mammal records came from the 500+ dormouse nestboxes that have been sited around the county by the Dormouse Group. The best record concerned a Dormouse found in a new site in the Chilterns. The discovery of some young Dormouse with their eyes still closed at Whipsnade was also an important first for the Group showing the boxes are important for conservation as well as survey work.

Distribution surveys for Water Vole and Hare follow on from the Otter survey run by the Wildlife Trust and have produced some welcome extra information. Another survey, that of foxes, was run in conjunction with Bedford Museum and indicates not only an increasing population but a modern lifestyle that can adapt to living alongside the urban population.

Road deaths reached a new high for badgers with a staggering 73 deaths recorded on the county's roads, which is by far the largest yearly total. Also killed on the road were two Polecats and four Ferrets as well as an Otter in the far south of the county. The loss of an Otter is a major blow for the species in the county. On a more positive note a second phase of a re-introduction project for the Otter led to the release of four more animals this time in East Bedfordshire.

The deer of Bedfordshire had mixed fortunes during the year with no records of Red Deer, *Cervus elaphus* and very few Fallow Deer reported. On the positive side, however, we did have only our second record of Roe Deer (the first was at Dunstable in 1996)when Rebecca Barrett saw one at Salford on January 1st. The two small deer of Bedfordshire continue to do very well as was indicated by the number of records received for the year. The Muntjac has spread throughout the county where there is suitable habitat and the Chinese Water Deer is still spreading into new areas with new tetrads being added every year.

What is clear as the mammal distribution survey enters its final year, is that the majority of mammals are doing very well in adapting to the rapidly changing environment they find themselves in.

SYSTEMATIC LIST FOR 1998

Mole *Talpa europaea*

There were a further 47 tetrad records added during the year so we now have records from 88% of the county.

Hedgehog *Erinaceus europaeus*

A further 16 tetrad records were added. The first of the year was seen in a Studham garden on 21st February (CB, PB). Animals were still recorded at Studham (CB, PB), Radwell (PM) and Flitwick (JK) in December with an animal active at Whipsnade until the year's end (CT).

Pygmy Shrew *Sorex minutus*

There were 12 new tetrad records during the year. Dead animals were found at Moggerhanger (MB) and Dunstable Sewage Farm (PT). Three dormouse nestboxes at Studham were inhabited by this species (CT).

Common Shrew *Sorex araneus*

Twenty new tetrad records were added during the year. Animals were caught in Longworth traps at Radwell (AH). Another was seen in a dormouse box at Great Odell Wood (ME).

Water Shrew *Neomys fodiens*

The only record of the year was of one running across a car park at Turvey Abbey in August (Br JM).

Rabbit *Orytolagus cuniculus*

Thirty-three more tetrad records were added so that rabbit is still the most widely distributed mammal in Bedfordshire with records from 90% of the county. Numbers increased rapidly during the first six months of the year with over 100 counted at Dunstable sewage farm in June (PT). As in previous years myxamotosis decimated numbers in the latter part of the year,with large numbers of dead animals found at both Blows Downs, Dunstable (RD) and Dunstable sewage farm (PT).

Brown Hare *Lepus capensis*

A survey carried out by The Wildlife Trust from 1996–98 recorded hares in 131 tetrads. The results of this survey, which were kindly passed onto me, resulted in hare becoming the species with the most new tetrads added during the year, a very good total of 54. This makes hare now the third most widely distributed mammal in the county after rabbit and mole. Good numbers were reported from Southill Park (BN), whilst a large total of 27 were counted in six adjacent fields near Steppingley (JK). Double figure counts were also made at Wrest Park (10), Clifton (10),Meppershall (12) and Luton Airport (13). In contrast a decline in numbers was noted at Stopsley and Warden hills (LJ).

Dormouse *Muscardinus avellanarius*

A very unusual record concerned an animal sitting on a tree stump in a small wood at Studham in January (per JN). It had been disturbed whilst some forestry work was taking place but hopefully the very mild weather at the time would help it to survive. Also in Studham, a female was found in a nestbox in May when she weighed 15 grammes. She was also found in the same nestbox in June when she had put on two grammes in weight. The nestbox scheme showed how important it was in late September when a nest of five young were found at Whipsnade. Although they still had their eyes closed the very mild weather of the autumn could well have assisted them to survive (CT). As well as a conservation tool the nestboxes are also giving us valuable information about the distribution of the dormouse. This was illustrated in

October when one was found in a nestbox in the Chilterns in an area that was not known to have dormice (ME).

Fat Dormouse *Glis glis*

At least eight dormouse nestboxes at Studham were used by this species. Two youngsters were seen in separate nestboxes in September with one still occupying a box on the October check. **Plates 3, 4.**

Bank Vole *Clethrionomys glareolus*

There were thirteen new tetrad records of this attractive and widespread small rodent. One was seen feeding on seed on a bird table at Stotfold in February (AH), and another was found in a conservatory at Studham (CB, PB). Six dormouse nestboxes were occupied by this species in both woods and hedgerows at Studham, with three boxes being used to raise young (CT).

Short-tailed Vole *Microtus agrestis*

Another 13 tetrads were added during the year including a skull found in an owl pellet collected at Carlton (PA,TS).

Water Vole *Arvicola terrestris*

During the year the conclusion of an extensive survey by The Wildlife Trust led to an extra 23 tetrads being added to the mammal distribution maps (JG, MC). Although numbers may be low they have now been recorded from a very respectable 38 tetrads and have been reported to have returned to the river Lea in Luton (MMc).

Harvest Mouse *Micromys minutus*

There were three records during the year. A nest was found at Odell Country Park when a field was harvested (TS), another nest and a dead animal were found at Houghton Conquest (MD) and finally one was found drowned in a water container at Turvey Abbey (Br JM).

House Mouse *Mus musculus*

Another 11 tetrads were added during the year, making a total of 45 tetrads for this much under recorded small mammal. Although usually thought of as a species found in households, at Whipsnade Wild Animal Park it is commonly found in wheat straw stacks in the Dutch barns (CT).

Yellow-necked Mouse *Apodemus flavicollis*

There were three new tetrads added during the year. Trapping for the national survey led to one being trapped at Wrest Park in September (LL). A domestic cat at Rowney Warren had this species amongst its catches (per DP) and finally one was found drowned in a horse water trough at Haynes in November (per DP).

Wood Mouse *Apodemus sylvaticus*

Another 12 tetrads were added during the year. Six animals were trapped during March in Stotfold (AH), whilst others were found in dormouse nestboxes at Studham,Whipsnade, Sharpenhoe, Colworth, Melchbourne and Great Odell Wood (BDG).

Brown Rat *Rattus norvegicus*

Several road casualties were reported particularly in the late summer at harvest time. There were 27 new tetrads added during the year.

Grey Squirrel *Sciurus carolinensis*

There were 16 new tetrad records during the year. Several were recorded in gardens raiding food put out for birds. Black squirrels were recorded at Woburn (BN), Milton Bryan (BN) and Chicksands (DP). An albino squirrel was again reported from the middle of the county (DP).

Fox *Vulpes vulpes*

There was a very good total of 45 new tetrad records of this common mammal. This makes it the fourth most widespread mammal in the county. There were several records of road casualties as well as numerous records of animals seen in broad daylight particularly during the summer months. A pair with five cubs were observed in a bramble patch at Rookery south pit (RD, RN, PN). One in central Flitwick was the first the observer had seen there despite them being common around the outskirts (JK).

Badger *Meles meles*

With another 39 new tetrads added during the year the badger has now been recorded in over 50% of the county's tetrads. More research into territory size and badger behaviour has been carried out by The Bedfordshire Badger Group (RC). There was a total of 73 road deaths reported during the year which is the highest total ever recorded in Bedfordshire by far and is 23 more than were recorded last year, which was an average year for road deaths.

Monthly totals are as follows:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3	14	3	9	3	2	8	4	3	7	8	9

Although the deaths were spread throughout the year, February is again the month when they are most at risk on the roads with 20% of the yearly total just in that one month.

Otter *Lutra lutra*

As well as plenty of spraint evidence along the Great Ouse there was also a good sighting of one in the early afternoon in December, by a biologist carrying out a riverside survey there (TP). The only other sighting reported was of one seen on 5th September swimming in a lagoon at Dunstable sewage farm (LB). Two days later a young female was found dead on the Whipsnade to Dagnall road (Mrs D, JS). As there was no sign of a microchip implant when a post-mortem was carried out it was thought not to be one of the introduced animals of which there were four more introduced in the east of the county in the autumn (JG). This is the second reintroduction in the county as four were released in the west of Bedfordshire in 1996. As there have been no otter sightings in South Bedfordshire for over 40 years it is likely that the Dunstable animal was the same animal that came to such a tragic end at Whipsnade.

Ferret *Mustela furo*

There was a single definite record and that was of a large male polecat-type found dead on the road at Cainhoe Castle in March (CT).

Polecat *Mustela putorius*

There were six records of this species all in the south of the county and therefore quite near to the Ashridge Estate where there is known to have been some unofficial releases recently. All the records were in the second half of the year with the first a female road casualty, in July, on the Whipsnade to Dagnall road (DO). The next, a male,was found dead on the Tring road, Dunstable in September (MS). The other four animals, two adult males,an adult female and a young male were all at Whipsnade (KT).

Polecat or Ferret *Mustela* sp.

Five records during the year were either of Polecat or Ferret. One was a sighting and the other four were of road casualties. The sighting was of one at Pegsdon in September (KW). The road casualties were at Old Warden in January (CW), Pegsdon in April (AP), at Barton in June and finally also near Barton in September (KW).

Mink *Mustela vison*

Twenty-one new tetrad records were received during the year, mainly from the fieldwork carried out for The Wildlife Trust Water Vole survey, which also looked for Mink signs when surveying Bedfordshire's waterways (JG, MC).

Weasel *Mustela nivalis*

There were 20 new tetrad records added during the year. All the records were of single animals.

Stoat *Mustela erminea*

Fifteen new tetrad records were added during the year. Most records were of animals seen singly although family groups of three and five were seen at Whipsnade (CT).

Chinese Water Deer *Hydropotes inermis*

There were nine new tetrads added during the year. They are spreading very well along the western side of the county with five animals counted in a field at Turvey, which is well north of their previous known limit (per TS). Numbers in their strongholds were very high with a county, and probably national, record count of over 20 in a single field at Briar Stockings in October (JA, DP, CW). Three road casualties near Cranfield in December were probably a result of the rut which reaches its peak during this month (DA).

Fallow Deer *Dama dama*

Records were received from only three sites with no large herds reported. Two stags and a pricket were seen at Kingshoe wood in February (CT), and two hinds were seen in nearby Briar Stockings in September (JA). Also in September a large stag was seen near Whipsnade crossroads when it startled the observer by crashing through the undergrowth (DAm).

Muntjac *Muntiacus reevesi*

Another 34 tetrads were added during the year so that now Muntjac has been recorded in over 60% of the county's tetrads. A count of 18 was made in the 60 hectare wood at Marston Thrift (BDS).

Sika Deer *Cervus nippon*

The only record during the year was of three seen together at Briar Stockings in September (JA).

Roe Deer *Capreolus capreolus*

Only the second county record was that of a female seen at dusk on January 1st near Salford (RB). A good description was received with the record. It was near to the Buckinghamshire border where Roe Deer are known to occur.

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Cliff Tack is the Society's Mammal Recorder, a position he has held in an honorary capacity since 1991.

REPTILES AND AMPHIBIANS
by Helen Muir-Howie

Grass snake *(Natrix natrix)* sightings form the majority of this year's records. They continue to be found in their known locations along the valley of the Great Ouse, namely Bromham, Oakley, Felmersham, Harrold/Odell Country Park and Sharnbrook, but they are being found more frequently in the Ivel Valley too, largely thanks to the field work being done by Marcus Phillips and Alistair Muir-Howie. They have been reported from Biggleswade, Sandy and Blunham. Nancy Dawson informed me of a sloughed skin found at Sandy Heath.

Common Lizards *(Lacerta vivipera)* were seen again at Sharnbrook Summit by Tony Smith.

Vic Arnold reported finding Common Frog, Common Toad and Smooth Newt at Maulden Woods. Frogs and toads also spawned in his garden pond in Luton.

In March, Andy Fleckney and I recorded an item on amphibians for a programme on wetlands to be featured in ITV's "Going Wild" series. We showed Common Frogs at Cople Pits Nature reserve and a Smooth Newt at Felmersham Nature Reserve (this was taken to the site from my garden pond in Bromham in case we could not catch one of the resident population). Whilst at Cople we saw many Common Toads too.

I would like to thank everyone who sent in records for the year.

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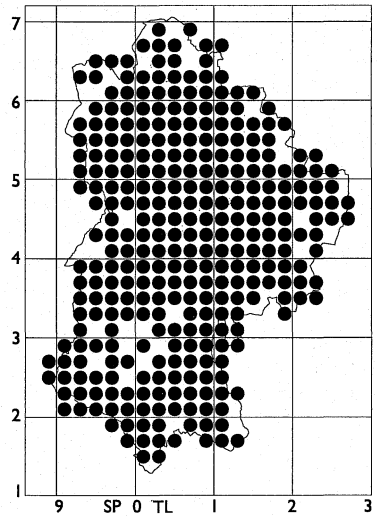
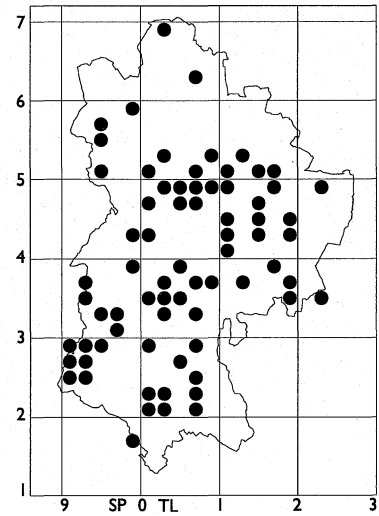
MAMMALS – BATS
by Joan Childs and Tony Aldhous

Distribution of bat records

In 1998 bats were recorded in 72 tetrads (2 km x 2 km squares). This is lower than previous years: 1997–85, 1996–90, 1995–96, 1994–94, 1993–88, 1992–88, 1991–101 and 1990–98 tetrads. 1998's records are approximately evenly spread across the county. There were 187 records of bats during the year. The number of tetrad records is lower than the actual number of bat records, because some tetrads will have more than one bat record, and some records will not be attributable to tetrads.



Bat records from 1987 to 1998



Bat records for 1998

Earliest active bat records

The first active bat of 1998 was seen flying on 9 January by Peter Almond in Bromham Park. There were three other January records – a female Brown Long-eared bat caught by a cat in Arlesey on 7 January, a bat found in a bath in a house in Sharnbrook on 21 January, and an unconfirmed Pipistrelle found at the end of the month in a toilet in Shuttleworth. The latter two bats may have come out of hibernation searching for water.

Latest active bat records

Peter Smith reported three unconfirmed Noctules flying at 4.45 pm (dusk) along the west side of Stewartby Lake on 8 November. He also saw bats hunting along hedgerows the same evening at his home in Eversholt. A couple also reported seeing a bat on 10 November when they entered the loft space of their house in Wootton. The bat was flying and hanging on rafters. A subsequent visit from licensed bat worker Philip

Irving identified a roost of probable Pipistrelles from a small number of droppings at the north end of the loft. An injured Brown Long-eared Bat was found on 15 November in Ampthill.

Daubenton's Bat *Myotis daubentonii* (Kuhl, 1819)
Confirmed records: 3 winter roosts
1 summer roost
4 sightings
Unconfirmed records: 2 sightings
Summer roost:
None of the traditional tree roosts known at Stockgrove Country Park were active during 1998, however a Daubenton's Bat was located roosting in a north-facing bat box on an oak tree at Stockgrove. This is the first time a Daubenton's Bat has been found in a bat box in the county.
Winter roosts:
Hibernating Daubenton's Bats were found in January (four bats) and February (four bats) but none were found in December. Old Warden Tunnel, Silsoe ice-house and Southill ice-house were the sites used by this species. The maximum number of bats hibernating in one site was four in Old Warden Tunnel in January.
Other records:
Daubenton's Bats were mist-netted by Tony Aldhous (under licence from English Nature) at Ickwellbury on 2 May, Stockgrove Country Park on 27 July (a juvenile) and the Southill/Old Warden area on 24 July, and a male was caught by a cat and later died in Sandy on 17 August. Unconfirmed Daubenton's Bats were reported flying over the River Ivel near Biggleswade and over water at Shuttleworth.

Whiskered Bat/Brandt's Bat *Myotis mystacinus/Myotis brandtii* (Kuhl, 1819/Eversman 1845)
Confirmed records: 1 summer roost
Summer roost:
A large roost in a house in Renhold is the only known maternity roost of Whiskered/Brandt's Bat in the county. At least 300 bats were present. Unfortunately it is likely that this roost will have to be excluded at the request of the owners of the house.

Natterer's Bat *Myotis nattereri* (Kuhl, 1818)
Confirmed records: 1 summer roost
7 winter roosts
Summer roost:
An active roost in a house in Greenfield produced a long-dead Natterer's Bat in April.
Winter roosts:
Hibernating Natterer's Bats were identified in Silsoe ice-house, Woburn ice-house, Woburn rockery tunnel, Woburn road tunnel, Barton lime-kiln tunnel, Southill ice-house and Old Warden Tunnel. They were seen hibernating in January, February and December. The maximum number seen together was 13 in Old Warden Tunnel, and Woburn rockery tunnel also held good numbers. Although this species is uncommonly found in the summer, it is the commonest species recorded in the winter.

Noctule *Nyctalus noctula* (Schreber, 1774)
Confirmed records: 3 summer roosts
1 sighting
Unconfirmed records: 4 sightings
Summer roosts:
Two roosts were located in traditional sites in trees at Stockgrove Country Park. An oak tree was used on 10 August when seven bats were counted out, and a pine tree was used between 6 July and 3 August with a maximum of 10 bats counted out. Flying bats were seen feeding over the lake at Stockgrove between 6 April and 3 August. A nursery roost was also located in a tree in the Southill/Old Warden area. A bat was caught (under licence) as it emerged from this roost as part of a national noctule survey.
Other records:
A dead bat was reported from Howbury Hall in Bedford on 1 May by Rosemary Parslow. Unconfirmed flying bats were also seen at Potton by Tony Aldhous, Kempston (feeding on beetles by the River Great Ouse) by Sheila Alliez, Shuttleworth, and three at Stewartby Lake by Peter Smith on 8 November.

Pipistrelle
Wherever possible, Pipistrelles were identified to species, either Common Pipistrelle, *Pipistrellus pipistrellus* (formerly 45 kHz 'bandit' Pipistrelle) or Soprano Pipistrelle, *P. pygmaeus* (formerly 55 kHz 'brown' Pipistrelles).

Common Pipistrelle *Pipistrellus pipistrellus* (Schreber, 1774)
Confirmed records: 6 summer roosts
20 sightings
Unconfirmed records: 2 summer roosts
3 sightings
Summer roosts:
Two bat boxes in Priory Country Park had this species inside on 26 April with one bat in one box and 12 in the other, and one bat was recorded in an east-facing bat box at Stockgrove Country Park. Roosts were also present in houses in Meppershall and Pulloxhill. A total of 23 bats were counted out of the roost in Pulloxhill on 31 June. The roost was located between the wall and the chimney and a juvenile was found on the path of the property. John Adams' prematernity gathering roost in his house in Haynes peaked at 119 bats this year and was reconfirmed as this species by Bob Cornes on 15 May when a bat was caught under licence from English Nature. The unconfirmed roosts were a bat box in Priory Country Park containing 10 bats, and a house in Sundon Park, Luton.
Other records:
Bats were mist-netted under licence from English Nature by Tony Aldhous at Ickwellbury and the Southill/Old Warden area. Bats were recorded trapped in houses (one in a sink in Clophill and three together in a house in Dunstable with no sign of a roost), one trapped in the Moot Hall in Elstow and one trapped in a warehouse in Dunstable. Injured bats were found in Dunstable (two), Linslade, Pulloxhill, Leighton Buzzard (two), Carlton, Biggleswade, Bedford and Toddington. Grounded bats were

found at Maulden, Keysoe and Bedford, and a dead bat was found in Dunstable. The unconfirmed sightings were of bats in flight, identified by bat detector, on the River Ivel between Broom and Biggleswade, and at Shuttleworth.

Soprano Pipistrelle *P. pygmaeus*

Confirmed records: 7 summer roosts
1 sighting
Unconfirmed records: 2 roosts
4 sightings

Summer roosts:

Two bat boxes were used at Priory Country Park with two in one box and four in the other. A north-facing bat box on an oak tree at Stockgrove Country Park contained one bat, and an east-facing box at Stockgrove contained one bat which could not be positively confirmed as this species. Fifty-five bats emerged from a roost in a house in Meppershall (one was caught under licence by Bob Cornes). A juvenile bat was returned to a roost of 150-200 bats in a house in Sharnbrook. Bats were reported back in a house in Great Barford (these bats had not returned last year, but were present in 1996). A total of 459 bats were counted out of a building in the Southill/ Old Warden area. An unconfirmed Soprano Pipistrelle was seen to enter a building in Shuttleworth.

Other records:

The confirmed sighting was a bat mist-netted by Tony Aldhous on 2 May at Ickwellbury. Unconfirmed bats were seen flying along the River Ivel between Broom and Biggleswade, and bats were also seen flying in Turvey. A dead bat which was too dessicated for positive identification was found in the Moot Hall in Elstow.

Pipistrelles not identified to species

Confirmed records: 2 summer roosts
11 sightings
Unconfirmed records: 11 summer roosts
12 sightings

Summer roosts:

The confirmed roosts were in a house in Linslade and in the porch of a house in Flitwick (a bat from this roost was caught by a cat). The unconfirmed roosts were under the gutter of a house in Luton where 19 bats emerged on 26 May, in the Moot Hall in Elstow, in the attic of a house in Heath and Reach (a bat was returned to this roost after it was found in the house), in a house in Potton, in a cottage in Turvey, in a house in Arlesey where 15 to 20 came through the loft trapdoor when it was left open, in Potton Church, at the north-facing end of a house in Wootton, behind the south-facing soffit board of a house in Blunham (this roost has been present for the last six or seven years), under the soffit of a house in Westoning (the householders reported that each year for three years they had bats in the house, but this year 18 or 19 bats had got into the house), and under the eaves of a house in Toddington.

Other records:

The confirmed sightings were a grounded bat in Luton, injured bats from Leighton Buzzard, Clifton, Caldecote, Arlesey, Sharnbrook, Cranfield, Northill and Aspley

Guise, and baby bats found orphaned in Biggleswade and Woburn. The unconfirmed sightings were grounded bats in Shuttleworth and Riseley, bats flying in Potton, Sandy, Haynes, Chicksands Wood and Stotfold, a bat found low in vegetation by a moth trap in Carlton, a bat found in a toilet in a building in Shuttleworth, bats trapped in houses in Flitwick and Souldrop, and a bat found behind a picture in a house in Leighton Buzzard.

Unidentified bats

Records: 12 summer roosts
19 sightings

Summer roosts:

Most of these were in houses – 20 bats emerged from the cavity wall of a house in Shortstown and two bats found below the roost were successfully returned, roosts were located under the eaves of houses in Bromham and Maulden and a bat found under each was returned, a house in Cockernhoe with a roost reported a bat in the sink which was returned to the roost, a bat was found in Luton at an address which had a roost next door, 50+ bats emerged from a house in Ickwell, a bat was found in the bath of a house in Sharnbrook which has a roost, and a roost in a house on the Chicksands Base was reported. One roost was in a bat box, one was in Westoning Church, one was reported from a disused railway signal box near Ridgmont, and one was in a tree in Dunstable due to be felled because it was unsafe. In addition, a number of potential tree roosts were reported which warrant further investigation.

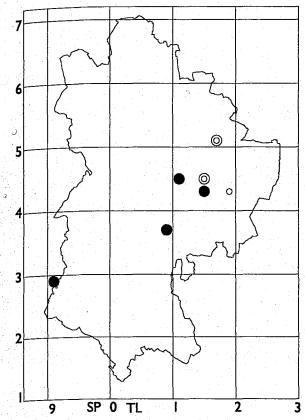
Other records:

Flying bats were seen in Bromham, Cople, Biggleswade, Luton and Eversholt. Bats were reported in houses in Maulden, Luton, Linslade and Tingrith. Injured or grounded bats were reported from Luton, Flitwick, Bedford, Dunstable, Kempston Rural, Lidlington, Lower Shelton, Linslade, Clapham and Houghton Regis.

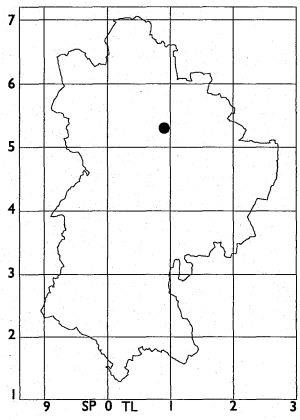
Continued on page 26

Key for species distribution maps

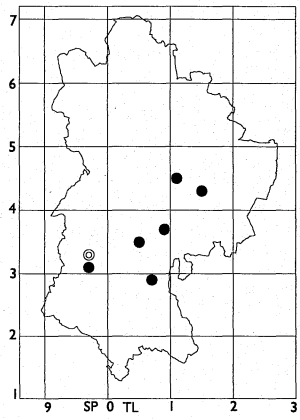
- ● Confirmed roost
- ⊙ Confirmed bat and unconfirmed roost
- ⊙ Confirmed bat
- • Unconfirmed roost
- ◦ Unconfirmed bat



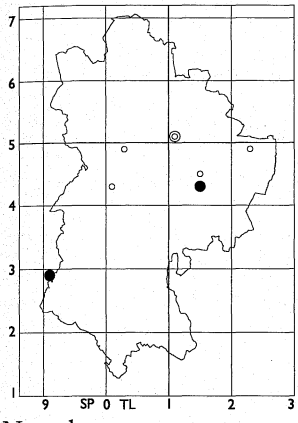
Daubenton's Bat



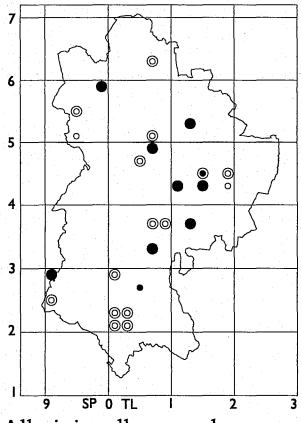
Whiskered Bat/Brandt's Bat



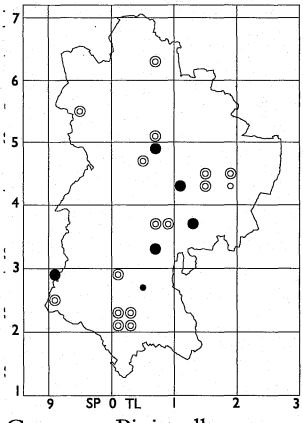
Natterer's Bat



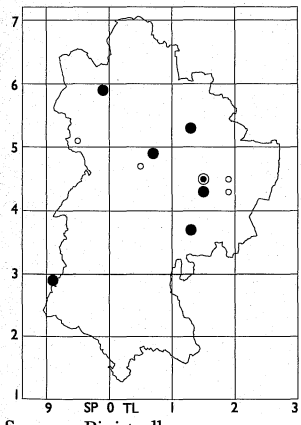
Noctule



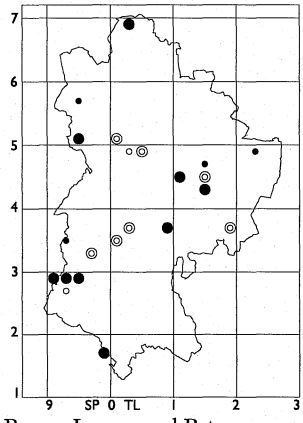
All pipistrelle records



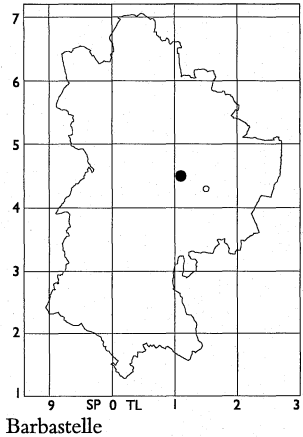
Common Pipistrelle



Soprano Pipistrelle



Brown Long-eared Bat



Barbastelle

Summer roosts:

The confirmed summer roosts were in a house in Clophill, in a barn in Turvey, in Shuttleworth House (a bat found grounded was returned to the roost) and Battlesden House (eight were seen in the roof apex), and in six bat boxes and an oak tree and a Scot's pine in Stockgrove Country Park. The unconfirmed roosts were in Northill and Potton Churches, the lofts of houses in Aspley Heath and Harrold, and in a house in Sandy (a bat found in the house was returned to the roost).

Winter roosts: The winter roosts were in Southill ice-house (a maximum of two), Silsoe ice-house (a maximum of five), Old Warden Tunnel (a maximum of two), Whipsnade bear pit (a maximum of four using three out of the four purpose made winter bat boxes, two for the first time) and Woburn rockery tunnel (a maximum of one. Hibernating bats were found in January, February and December.

Other records:

Injured bats were found in Arlesey, Steppingley (where there was a possible roost) and Ampthill and a grounded bat was found in a car park in Bedford. A bat was found in a house in Bromham and a dead bat was found in a house in Aspley Guise. Unconfirmed Brown Long-eared Bats were reported dead in Kempston and Leighton Buzzard.

Barbastelle *Barbastella barbastellus* (Schreber, 1774)

Confirmed records: 1 winter roost
1 sighting

Unconfirmed records: 1 sighting

Winter roost:

A hibernating barbastelle was found in Old Warden Tunnel in January. This is probably the same bat that has hibernated in the tunnel since December 1995, making it the sixth Barbastelle record for the county this century.

Other records:

Tony Aldhous mist-netted a male barbastelle outside Old Warden Tunnel on 24 September. An unconfirmed record came from the Southill/Old Warden area when barbastelle calls were identified using a time-expansion bat detector.

Joan Childs and Tony Aldhous are the Society's joint Bat Recorders. They have held these positions in an honorary capacity since 1991. They run the Bedfordshire Bat Group which produces an Annual Report and a quarterly newsletter *Bats in Beds*.

FISH
by Harvey Winter

This report for 1998 includes comments on the six small fish species found in the county, two of which are mentioned in EEC Habitat Directives. Because these small species are considered to be under-recorded attention has been given to them in recent years but much work remains to be done to trace their distribution in the county. The Barbel is one of our largest species and as a contrast is also discussed as it is of some interest this year.

Records are now maintained on a 1km square basis but in this report reference is made to tetrads to allow direct comparison with previous reports and tetrad maps. Scientific names are confined to the final species listing.

SPECIES REPORTS

Spined Loach

The nationally scarce Spined Loach is mentioned in EEC Directives and so is of particular interest. Existing county records appear to show a species preference for slow flowing water but two still water sites are included, although as both are situated close beside the Great Ouse flooding from the river is a possible source of introduction.

This loach is of secretive habit and so generally escapes observation. It does not often feature in Environment Agency fishery surveys possibly because the methods employed are not designed to secure such species. Although apparently scarce, large numbers were assembled together, possibly for spawning activity, when seen and recorded by Richard Revels at the Oakley site in 1990.

To date the Spined Loach has been recorded eleven times from sites in nine tetrads all of which are detailed below.

1948 New Cut, Bedford	No ref.	TL04U/P	F.G.R. Soper
1948 Longholme Boating Lake, Bedford	No ref.	TL04U/P	F.G.R. Soper
1976 R. Ivel, Tempsford	161534	TL15R	A. Weston
1983 R. Gt. Ouse, Fenlake	069488	TL04U	NRA
1988 R. Gt. Ouse, Biddenham	015511	TL05A	NRA
1990 R. Gt. Ouse, Oakley	008529	TL05B	RR
1991 New Cut, Bedford	074495	TL04U	NRA
1991 Campton Brook, Campton	128377	TL13I	NRA
1995 R, Ivel, Blunham	154526	TL15L	NRA
1997 Felmersham NR	994586	SP95Z	B. Nau, S. Cham, H. Muir-Howie, Alston
1997 R.Gt. Ouse, Clapham	035522	TL05G	EA

Stone Loach

The Stone Loach closely resembles the preceding species but is much more commonly found and widely distributed in the county at a variety of sites. There are 50 records including 30 received since 1990. The following relate to 1998.

Felmersham NR	994586	SP95Z	RR *
Stream, Cople	101492	TL14E	RR *
Renhold Brook	087518	TL05V	CA *

Minnow

Thirty-five of the existing 54 records of Minnow date from the 1990s, the majority from the Rivers Great Ouse and Ivel with only 11 referable to other sites. The following were received during 1998, some of which refer to previous years.

R. Gt. Ouse, Pinchmill Is.	996589	SP95Z	MD	*
R. Gt. Ouse, Milton Ernest viaduct to mill	010559 to 018550	TL05C	MD	
R. Ivel, Biggleswade Mill and back meadows	185440 to 186460	TL14X	MD	
R. Ivel, Holme Mill area	183420 to 185440	TL14W	MD	
R. Gt. Ouse, Harrold	958565	SP95T	EA	*
R. Gt. Ouse, Radwell	015583	TL05E	EA	
R. Gt. Ouse, Biddenham	010503	TL05A	EA	*
R. Ivel, N. of Biggleswade Common	183475	TL14Y	RR	*
Ditch, Cople	103493	TL14E	RP	*
Renhold Brook	087518	TL05V	CA	*

Ten-spined Stickleback

The Ten-spined Stickleback is not yet reported from the major rivers Great Ouse and Ivel although it must surely be represented there. Eighteen sites are recorded all since 1976. Four records relate to the 1990s including two for this year as follows.

Priory CP, Bedford, main lake	073491	TL04U	HW	
Dyke, Biggleswade Common	188465	TL14Y	RR	
Renhold Brook	087518	TL05V	CA	*
Ickwell Moat	153454	TL14M	MD	*

Three-spined Stickleback

The Three-spined Stickleback is the most widely distributed and commonly found small fish species in the county, recorded 98 times of which 63 date from the 1990s. It is present at the widest variety of sites ranging from the major rivers, Great Ouse and Ivel, to small streams and areas of standing water. Listed below are the records received during 1998, some of which refer to previous years.

R. Gt. Ouse, Carlton	941548	SP95M	EA	*
R. Gt. Ouse, Clapham	035522	TL05G	EA	*
R. Gt. Ouse, Biddenham	010503	TL05A	EA	*
Ickwell Moat	153454	TL14M	MD	*
Hillrise NR, Bedford	046510	TL05K	BA	*
Cople Pit NR (11 and 4)	103491/104492	TL14E	RP	*
Cox Pit, Sandy	180497	TL14Z	RR	*
Stream, Cople NR	101492	TL14E	RR	*
Dyke, Biggleswade Common	188465	TL14Y	RR	*
R. Ivel, N of Biggleswade Common	183475	TL14Y	RR	*
Renhold Brook	087518	TL05V	CA	*
R. Ouzel, Slapton Bridge	933216	SP92F	PM	*
R. Ouzel, L. Buzzard	919228	SP92B	PM	*

Bullhead

The Bullhead is the second of our fish species mentioned in EEC Directives and one which recent recording work has revealed to be more widespread in the county than previously indicated. There are presently 66 records including 52 secured since 1990, equally divided

between the two major rivers Great Ouse and Ivel and a miscellany of lesser sites, principally in the south of the county.

The following records were received in 1998, some of which refer to previous years.

Brook, Higham Gobion	108329	TL13B	RS	⋆
Stream, Cople NR	101492	TL14E	RR	⋆
R. Gt. Ouse, Blunham to Roxton Lock	145534 to 160535	TL15L	MD	⋆
R. Gt. Ouse, Carlton	951543	SP95M	EA	⋆
R. Gt. Ouse, Harrold	958565	SP95T	EA	⋆
R. Gt. Ouse Biddenham	010503	TL05A	EA	⋆

⋆ denotes new site or tetrad record 1998 reported in 1998.

Barbel

Past annual reports have mentioned the success of the Barbel in the upper Great Ouse between Turvey and Bedford but the most recent Environment Agency fish population survey of this stretch of the river, completed in November 1997, comments upon the very poor recruitment of the species since 1991. The strong water flow between November 1997 and the spring of 1998 prevented the survey of some sites but the species was shown to have declined numerically particularly at the previously important site at Radwell where none were found.

The concern is for the future of the species in the upper Great Ouse but the presence of large Barbel in this stretch of the river is widely reported making it a popular venue with anglers.

Following recent introductions records are now received from the New Cut and Cardington Mill area below Bedford and from the River Ivel at Biggleswade and Sandy.

Finally, we must correct an error in the 1997 report which stated that complete tetrad maps for fish species had not previously been published. Mr Tony Peterkin was the Society Fish Recorder for 11 years from 1976 and points out that tetrad maps of all species then known from the county were included in his report for 1978 *(Bedf. Nat.* **33** p43). These provide interesting comparison with those of 1997. Our apologies to Mr Peterkin.

Records received in 1998 for new sites or tetrads

All species and hybrid

Family CYPRINIDAE

Common Carp *Cyprinus carpio*

TL05E, 15T/L, Gt. Ouse
TL23I, Ivel
TL03H, stream
TL03S, 05D/E, 13D/Z, 14K/U/W, 15A/F, still waters

Bleak *Alburnus alburnus*

SP95W, TL04D, Gt. Ouse
SP95Z, TL05E, 15F, still waters

Rudd *Scardinus erythrophthalmus*

SP96V, TL02M, 03S, 05E, 13D/Z, 14U/W, 15A/F, still waters

Dace *Leuciscus leuciscus*

TL05V, Renhold Brook
SP95Z, still water

Roach *Rutilus rutilus*
TL14V/X, 23I, Ivel
TL04Z, Elstow Brook.
TL02M, 03S, 13Z, 14K/W/Y, 15A/F, still waters

Common Goldfish *Carassius auratus*
SP92E, still water

Tench *Tinca tinca*
SP95Z, Gt. Ouse
TL14X, Ivel
SP95Z, TL02M, 03B, 05D/E, 14K/W, 15F, still waters

Common Bream *Abramis brama*
TL05B, Gt. Ouse
TL14V, Ivel
TL03B, 05B/D/E, 13Z, 14K/U/W, 15A/F, still waters

Silver Bream *Blicca bjoerkna*
TL05A, Gt. Ouse

Chub *Leuciscus cephalus*
SP95X, TL04D/E/J, 05F, Gt. Ouse
TL14V, Ivel
TL05R, Renhold Brook
SP95Z, TL15F, still waters

Crucian Carp *Carassius carassius*
SP92E, TL02B, 03Q/S/X, still waters

Gudgeon *Gobio gobio*
SP95W, Gt. Ouse
TL05V, Renhold Brook
SP92E, TL 02M, still waters

Barbel *Barbus barbus*
SP95Z, TL04E, Gt. Ouse
TL14X, Ivel

Minnow *Phoxinus phoxinus*
See individual species report

Roach x Common Bream Hybrid
SP95Z, Gt. Ouse
SP95Z, TL05E, still waters

Family SILURIDAE

Wels or European Catfish *Silurus glanis*
SP92C, Grand Union Canal
SP92E, 95Z, TL05F, 13Z, still waters

Family ANGUILLIDAE

Eel *Anguilla anguilla*
TL05D/E, Gt. Ouse
TL05V, Renhold Brook
TL04H, stream
TL14W, Ivel
SP95Z, still water

Family PERCIDAE
Zander *Stizostedion lucioperca*
SP93U/Z, still waters
Perch *Perca fluviatilis*
TL04D, Gt. Ouse
TL23I, Ivel
TL02M, 05E, 13D/Z, 14Y, 15A/F, still waters

Family ESOCIDAE
Pike *Esox lucius*
TL04D, Gt. Ouse
TL05E/F, 13Z, 14K/M/W, 15A/F, still waters

Family SALMONIDAE
Rainbow Trout *Salmo gairdneri*
TL14Y, still water

Family COTTIDAE
Bullhead *Cottus gobio*
See individual species report

Family GASTEROSTEIDAE
Three-spined Stickleback *Gasterosteus oculeatus*
See individual species report
Ten-spined Stickleback *Pungitis pungitis*
See individual species report

Family COBITIDAE
Stone Loach *Noemacheilus barbatulus*
See individual species report
Spined Loach *Cobitis taenia*
See individual species report

ACKNOWLEDGEMENTS

The following individuals supplied records and information, all of which is appreciated.

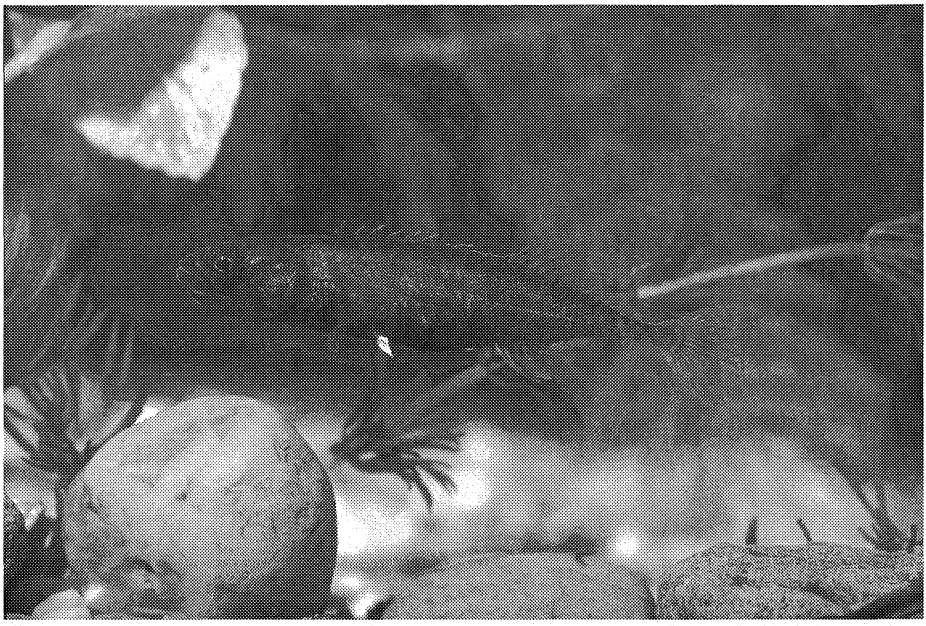
P. Almond, B. Anderson, C. Andrew, R. Bates, Mr & Mrs Beatham, M.J. Butler, J. Cartey, M. Dawson, P. Madgett, D. Manning, E. Newman, B. Nightingale, M. Paine, R. Parsonage, N. Perkins, T. Peterkin, R. Revels, R. Spendlove.

Thanks to the Environment Agency for once again providing copy of fish population surveys. Also to M. Dawson who has maintained complete records of species seen whilst angling in company with M. Green. Mr Dawson was able to submit over 400 individual records which included 44 new site records and 20 new tetrad records.

REFERENCES

Fish Population Survey of River Gt. Ouse, Newport Pagnell to Bedford, October/November 1997. Environmental Agency Central Area – Anglian Region.

Harvey Winter is the Society's Fish recorder, a position he has held in an honorary capacity since 1990. He is a Fellow of the Royal Entomological Society and Zoological Society of London.



Ten-spined Stickleback, a small species not yet recorded from the rivers Great Ouse or Ivel.
Photo: Richard Revels

RE-ESTABLISHMENT OF THE NATTERJACK TOAD *Bufo calamita* TO HEATHLAND AT AN RSPB NATURE RESERVE IN BEDFORDSHIRE

(Based on a paper given at the 27th Eurosite meeting in 1996)

by James Cadbury

(The Royal Society for the Protection of Birds, The Lodge, Sandy, Bedfordshire, England)

Abstract

The Natterjack has suffered a major range contraction in Britain this century. It has almost disappeared from heathland on which it was formerly widespread in southern England. Sand dunes and grazing marshes on the coast of north-west England and south-west Scotland now have the bulk of the indigenous Natterjack population in Britain; a few colonies persist on the east coast. To help reinstate Natterjacks on sandy heathland, the species was translocated as spawn to the RSPB Lodge reserve, Sandy (Bedfordshire) in 1980 and also to Minsmere (Suffolk) in 1985. At least at the former site re-establishment has been highly successful. Management has included the creation of shallow ponds for breeding, maintaining water of about pH 7.0 in these ponds between April and August, but emptying them for a period in winter, keeping the ponds clear of vegetation and aquatic predators, and preventing the surrounding heath from being invaded by scrub. The main method of monitoring the colonies has been counting the number of spawn strings laid annually. A translocation to coastal grazing marsh at the RSPB Mershead reserve on the Solway (Dumfries and Galloway) was undertaken in 1999.

Status of the Natterjack

The Natterjack, as an indigenous species, is entirely restricted to Europe where it occurs in 16 countries. Its range is largely in the south-west (Spain, Portugal and France), but it occurs as far north as Sweden and east to Poland. It receives legal protection under Annex III of the Bern Convention 1979, and Annex IV of the EC Habitats and Species Directive 1992. In Britain it is also protected under Schedule 5 of the Wildlife and Countryside Act 1981.

In south-west Europe, the Natterjack frequents a wide range of habitats, but in Britain and Ireland, most of the extant colonies are on sand dunes and coastal grazing marshes. Formerly, however, this amphibian occurred on a number of lowland heaths, near the coast in eastern England and inland in the south. All but two indigenous inland colonies have become extinct; only one remains on heathland. The main centre of Natterjack distribution in Britain is now the coast of north-west England and south-west Scotland. Four indigenous coastal colonies still exist in eastern England. Natterjacks also occur in south-west Ireland (Figure 1). There is an indigenous colony of Natterjacks at an RSPB reserve in Cumbria, north-west England.

In Britain, Natterjacks have suffered severely from the destruction, degradation and fragmentation of lowland heath. This is largely attributable to agriculture, conifer afforestation, invasion by trees and scrub, urbanisation and road development. For example, in one county, Dorset, 75% of heathland (over 17,000 ha) has been lost

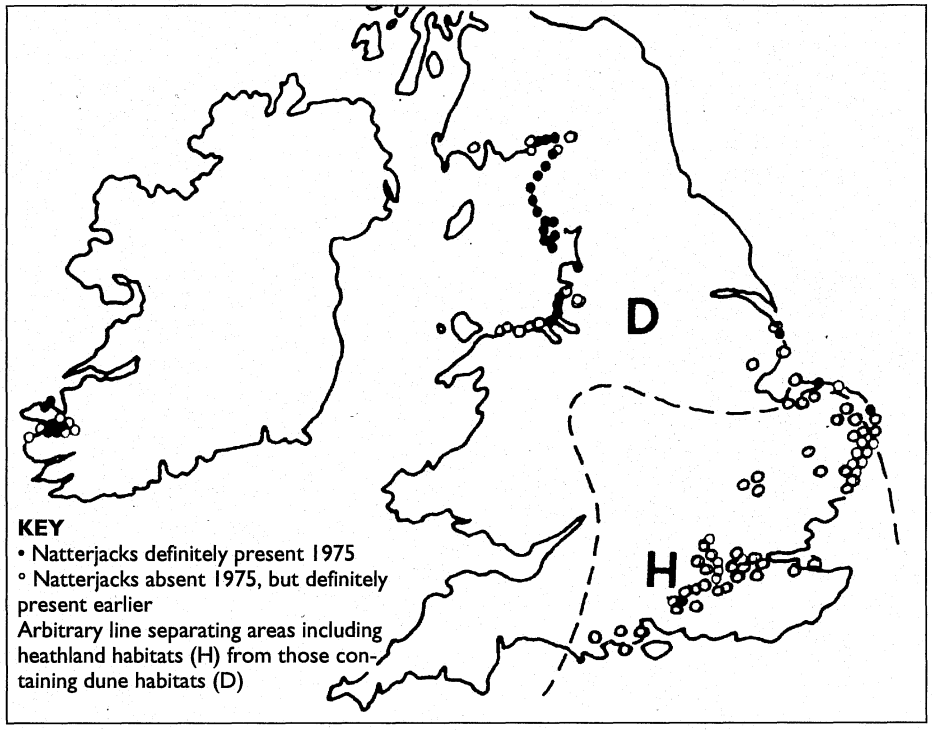


Fig.1 British distribution of the Natterjack (after Beebee 1977)

since 1900. Much of what remains is confined to small blocks of less than 100 ha. Coastal sites have suffered from built development, golf courses and particularly from the loss of suitable pools in which the toads can breed. Many pools dry up before the tadpoles have undergone metamorphosis.

The major range contraction of the Natterjack has prompted introductions/ re-establishment to several sites, including three RSPB reserves. The Natterjack has been the subject of an active English Nature Species Recovery Programme project (Denton *et al* 1995).

Re-establishment at RSPB reserves

The RSPB, though primarily a bird conservation organisation, is increasingly accepting responsibility for the conservation and monitoring of non-avian taxa at its 152 nature reserves in the UK. Introductions to reserves are, however, only approved by the government nature conservation agencies, if they comply with certain criteria:

- The site is within the former range of the species.
- The reasons for extinction in an area are largely understood.
- Its extinction was largely due to man's activities.
- The species would not recolonise naturally.
- Suitable environmental conditions are available or could be restored and sustained.

- Its reintroduction is unlikely to affect other species of conservation concern deleteriously.

In 1979, the RSPB, together with the British Herpetological Society, decided to re-establish the Natterjack at The Lodge reserve, at the RSPB's headquarters, Sandy in Bedfordshire. Natterjacks were recorded from sandpits near Sandy in 1905 and the species may have persisted at a nearby heath until the 1930s. Actively excavated sandpits still exist in the area, but there were no suitable pools for breeding Natterjacks. The main heath has long been destroyed by agriculture, but a small isolated heath remained on The Lodge reserve. The nearest indigenous Natterjack colony was until recently on heathland in north Norfolk, 115 km away. This provided the source of spawn for the translocation to The Lodge. First, it was necessary to ensure suitable habitat existed at The Lodge reserve. Natterjacks need two habitats:

Aquatic: crucial for breeding

- Ephemeral pools that tend to dry out in late summer.
- Shallow water – maximum depth 30–50 cm.
- Freshwater (but up to 0.5% salinity at some coastal sites).
- pH 6–8 (not acid which is toxic to spawn).
- Warms up quickly, 15–28°C (for Common Toad *Bufo bufo* 10–20°).
- Water low in nutrients (reduces algal growth).
- Unvegetated (deters Common Toads, and aquatic predators).
- Free of aquatic predators (fish, newts, large water beetles, dragonfly nymphs etc) and competitors (such as the common toad).

Terrestrial: for feeding, hibernation etc; where adults spend most of their lives

- Sandy substrate – for burrowing, warms quickly.
- Cover e.g. heather, grass tussocks, rabbit burrows, boulders, concrete slabs and tiles.
- Free of trees – woodland harbours Common Toads.
- Home range of at least 100–200 m around pond.

The heath at The Lodge reserve in 1979 was only 3.6 ha in area. It is surrounded on three sides by mixed pine *Pinus sylvestris* and birch *Betula pendula* woodland with some Bracken *Pteridium aquilinum*. Sandy arable occupies the fourth side. The heath itself is on a gently south-west-facing, dry, sandy slope and is vegetated largely by Heather *Calluna vulgaris* and Wavy Hairgrass *Deschampsia flexuosa*. Much of the heather was, until recently, mature, even degenerate with bare patches of humus and sand.

A shallow pond, 10 x 10 m, was excavated on the heath in 1980. It has gently graded banks and a maximum depth of 30 cm. On the sandy substratum it was necessary to retain water with a 1,000 gauge polythene liner covered by a thin layer of sand. After 16 years the pond was relined with 1,500 gauge polythene. The spoil was used to construct a sandy bank in which the toads can burrow. To provide cover for emerging toadlets and breeding adults a few sandstone boulders and concrete slabs were placed near the margins of the pond, along with some clumps of heather and rush *Juncus effusus* (Figures 2 and 3). The pond is filled with mains water (with a neutral pH of 7.0) that has to be piped onto the acid heath. **Plate 1.**

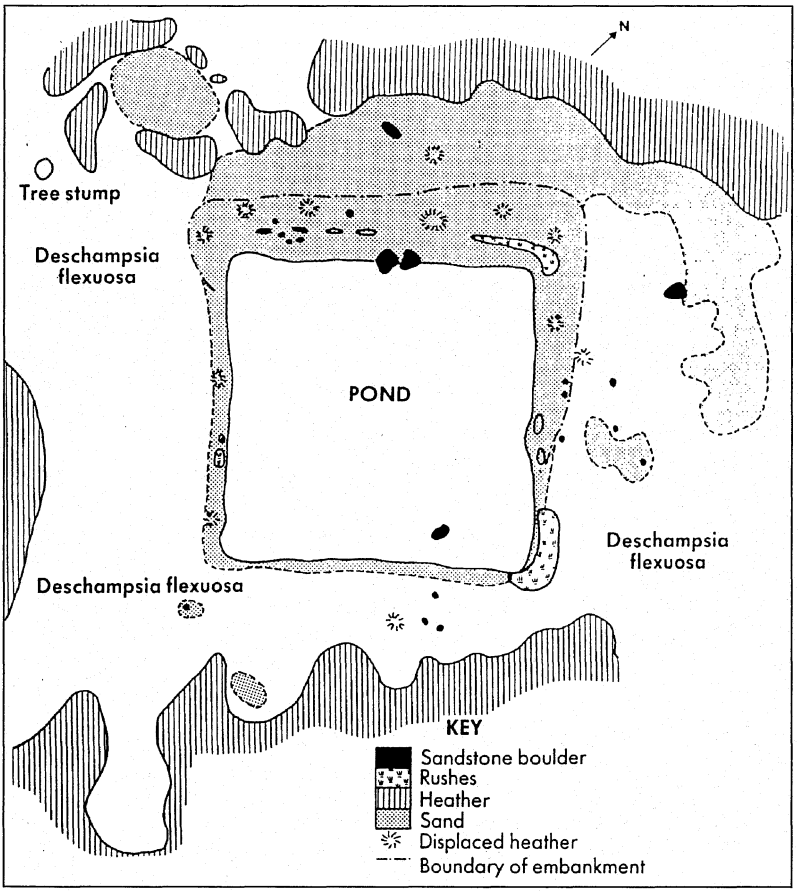


Fig. 2 The pond specially created for breeding Natterjacks on the heath at the RSPB's Lodge reserve, Bedfordshire (from Raw & Pilkington 1988)

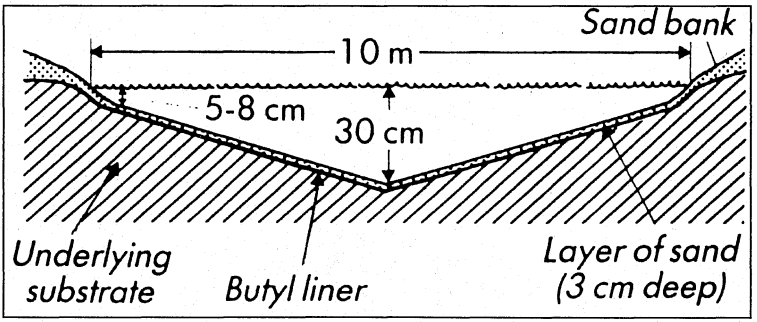


Fig. 3 Cross section through the Natterjack pond at the RSPB's Lodge reserve (from Raw & Pilkington 1988)

Segments from eight Natterjack spawn strings were introduced in 1980 and from a further six strings in 1981; all from the donor colony at Syderstone Heath, Norfolk. The translocation was licensed by the Nature Conservancy Council. The Lodge colony has required no further injections of spawn.

Establishment of The Lodge reserve colony

From 1983 onwards, spawn has been laid by adult toads in the introduced population. Sixty spawn strings were laid in 1987, 113 in 1991 and then in both 1992 and 1993 there was a sharp rise to just over 300. Subsequently the number laid annually has been lower, except in 1997 when again there were over 300 strings (figure 4). Normally a female lays only a single string (usually 2,000 – 3,000 eggs) in a breeding season. Most eggs are laid between late April and the end of May, but there is sometimes a second minor batch of laying in June and July. There are probably about 300 adult Natterjacks in the Lodge reserve population. **Plate 2.**

Natterjacks are clearly mobile. Though the core of the colony is centred around the heath pond, males were calling one km away (outside the reserve) in 1983, only three years after the first spawn was introduced. They have subsequently been heard calling and have attempted to breed at four other non-specialised, permanent ponds on the reserve, up to 470 m from the original pond. Natterjacks have also started breeding in a second pond constructed on the heath, close to the nature trail in 1995 (D & S Niemann in unpubl. rept.).

Population dynamics

Some idea of this is given in Table 1. A Natterjack may live up to 15 years, but in Britain reproductive age is not attained until three years (two in south-west Europe). There is a huge mortality of tadpoles and in the first year or so after metamorphosis. Probably only two to four adults survive to reproduce from every thousand eggs laid. Much of the mortality is due to predation.

Table 1 Natterjack population dynamics

Britain, 1st eggs laid at 3 years		
Longevity up to c15 years		
Eggs laid annually by female	average	c3,000 pa
c92% hatch		c2,760 tadpoles
<5% tadpoles survive (>11% at Lodge)		c150 (300*) toadlets
(losses mainly due to predation; also fungus and desiccation)		
c3.75% survival of toadlets to reproduction		c5 (11*) adult toads
1.7 (3.6) adults for every 1,000 eggs laid		

(*Estimated from Lodge survival rate)

Monitoring the population

The main method of monitoring the Natterjack population is by counting the spawn strings that are laid annually during the laying season. Formerly, strings were extracted from the pond soon after laying and placed in a perspex tank or in a receptacle with fine mesh net sides in the pond until the eggs hatched. This protects the spawn from

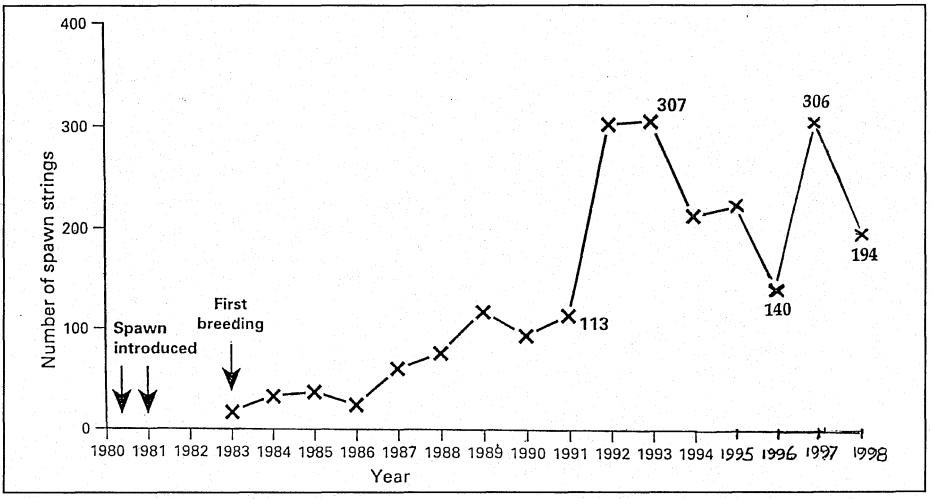


Fig. 4 Number of Natterjack spawn strings laid annually in the heath pond at the RSPB's Lodge reserve since 1983 (from Cadbury 1995)

predation which can be heavy and facilitates counting newly laid strings. Weekly checks should be made however if large quantities of spawn are kept in such containers, since it can die as a result of deoxygenation. Estimates of toadlets that have emerged from the pond have been made in some years. Adult males are best counted at dusk in warm wet weather in May and June, but only a proportion are likely to be present on any one night at ponds where breeding occurs. Few yearlings are recorded around the ponds. In the early years after the translocation, the dispersal and survival of the toads were checked using a grid of roofing tiles spread across the heath. Individuals were measured, weighed and sexed; they were individually marked by experienced herpetologists by means of careful toe clipping. The monitoring is undertaken by the RSPB reserves staff and the Herpetological Conservation Trust.

Pond management

After the toadlets have left the water, the pond is allowed to dry out and cleaned of debris and vegetation; also overwintering invertebrate predators are removed. The pond is refilled at the start of the Natterjack breeding season (April) and kept full throughout the summer. Such management helps create conditions similar to those of ephemeral ponds in which indigenous Natterjack populations breed. Mosses and such plants as Water Starwort *Callitriche* spp and Marsh Bedstraw *Galium palustre* form a dense, one metre wide mat of low vegetation on the pond margin, providing a moist transition zone between the water and dry heath for emerging toadlets. Vegetation is cleared from the pond itself at frequent intervals to make it unattractive to Common Toads. Invertebrate predators such as dragonfly nymphs, larvae of dytiscid water beetles and Back Swimmers *Notonecta glauca* are removed from the pond and transferred elsewhere on the reserve along with likely competitors – Common Toads and Smooth Newts *Triturus vulgaris*. Experiments elsewhere have shown the intro-

duction of a few small Carp or Perch *Perca perca* (but not Rudd) can much reduce aquatic predators (Denton *et al* 1995). Birds have not proved to be major predators of tadpoles or toadlets at the heath pond, though they could in other situations. Netting a pond would largely prevent this.

Heath management

The main management has been to keep the heath free of invasive birch, Scots Pine and Bracken. Since 1980 the area of the heath has been increased by nearly one ha to 4.5 ha. One third of the heath was burnt by vandals in 1985. This apparently had little direct effect on the Natterjack population, and may have improved the foraging habitat by opening up the heather sward. Heather regeneration, both from the rootstock of old plants and seed on the burnt areas was very poor initially, largely because of the old age of the plants, intensive rabbit grazing, and the accumulation of litter and nutrients at the ground surface that favoured Wavy Hair-grass *Deschampsia flexuosa*. Following scalping the heath surface down to mineral soil (sand) and the erection of rabbit-proof fenced exclosures, heather has regenerated well from seed in recent years. Elsewhere, mown heath was little used by Natterjacks of any age (Denton *et al* 1995).

The future

The Natterjack now appears to be firmly established as a result of translocations at The Lodge reserve and probably at Minsmere on the Suffolk coast. At the latter site translocation was undertaken between 1984 and 1992 using spawn and tadpoles from Winterton dunes in east Norfolk. Lodge population has been used to re establish the original donor colony at Syderstone, Norfolk that recently became extinct.

Much has been learnt about translocation techniques and heathland habitat management for Natterjacks from the two reintroductions at RSPB reserves. In a small way, the translocations have compensated for the massive range contraction of the Natterjack and re-established it on heathland. A translocation was undertaken at the RSPB Mershead reserve on the Solway (Dumfries and Galloway). The eventual aim must be to establish meta-populations which are sustainable without management.

ACKNOWLEDGEMENTS

For this paper I draw heavily on the management and monitoring undertaken by a succession of RSPB reserves staff at The Lodge since 1979. I wish to acknowledge the technical advice and monitoring by the British Herpetological Society/Herpetological Conservation Trust (notably by Paul Buckley) at The Lodge, and by Herpetofauna Conservation International at Minsmere. Helpful advice was also received from the Joint Nature Conservation Committee and English Nature. The idea of reintroducing Natterjacks to The Lodge reserve was originally proposed by my former colleague, Anthony Chapman.

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Plate 1: Natterjack Toad pond, RSPB Nature Reserve, Sandy. The shallow pond is specially created and managed for breeding Natterjacks on the heath at Sandy (p. 33). *Photo: Richard Revels*
Plate 2: Natterjack Toad, *Bufo calamita*, male. The Natterjack Toad, a species declining in range, has ben re-established at the RSPB Reserve, Sandy (p. 33). *Photo: RSPB*

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Plate 3: Fat Dormouse, *Glis glis* (p. 16). *Photo: Richard Revels*

Plate 4: Fat Dormouse, *Glis glis*, having chewed a larger hole in a nestbox set up for Dormouse (p. 16). *Photo: Cliff Tack*

FRESHWATER CRAYFISH
by Harvey Winter

This year the recorder was fortunate to have the assistance of Miss R. Longfield who undertook a study of crayfish distribution in the county as part of her course at Silsoe College. A separate report of the native species *(Austropotamobius pallipes)* has since been confirmed.

A variety of sites were searched and/or trapped this year as follows.

Several locations at small streams in the area between Barton le Clay and Shefford were sampled and the introduced crayfish *Pacifasticus leniusculus* was found at two sites:

i) the known site at Shillington (RL)
ii) south of Wrest Park, Silsoe, where a single specimen was found dead on a bank beside a stream (RL)

The native, *A. pallipes*, was reported to be present this year (RS) at one of the sites near Higham Gobion later sampled by RL when none were found. In March 1999 the site was searched again (JG/GB) and a single male specimen found to confirm the record.

Three sites near Leighton Buzzard with no positive result:

i) the Grand Union Canal near The Globe public house (RL)
ii) Clipstone Brook (RL)
iii) Battlesdon Brook (RL)

Several locations on Elstow Brook downstream from Bedford all without positive result (RL/HW).

Still water sites at Melchbourne and Arlesey without positive result (RL).

A single site at a crayfish farm where large numbers of Signal Crayfish (*P. leniusculus*) are maintained. The types of trap used in the survey were proved to be effective here (RL).

Several locations on the River Ivel and a stream at Cople with no positive result (RR).

We have learnt that surveys sometimes fail to locate crayfish as explained further in the article *Conservation of the White-clawed Crayfish in the County of Bedfordshire* elsewhere in this Journal. Therefore the apparent absence of the native *A. pallipes* from some sites may not necessarily indicate the species' complete absence as previously thought.

Finally the identity of crayfish reported to be present at Southill Lake has been resolved. Barry Nightingale was able to give a detailed description of several specimens seen at the site which shows they were undoubtedly Signal Crayfish.

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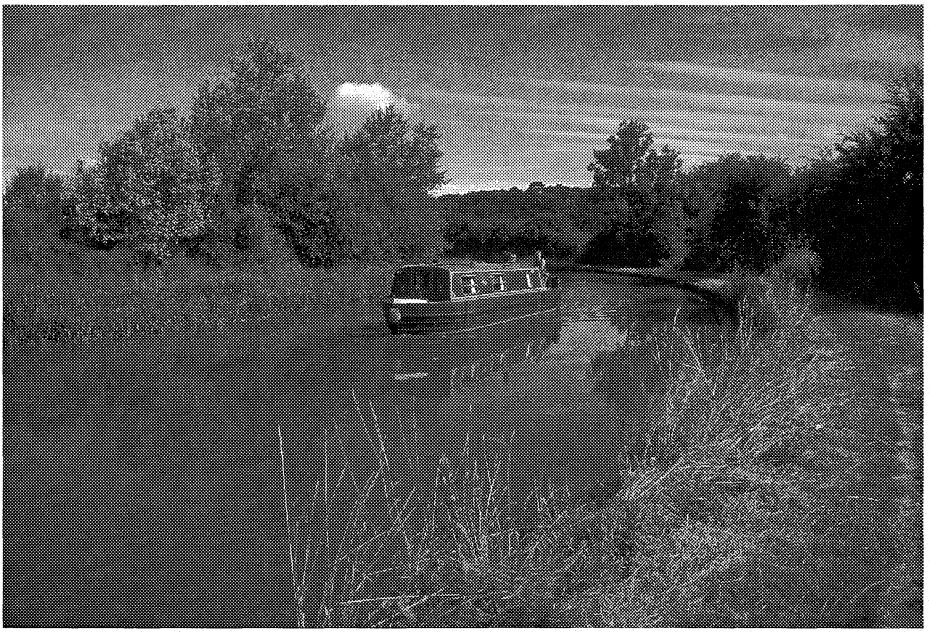

The Grand Union Canal near Linslade. A site where the native crayfish *(A. pallipes)* was recorded in the 1950s and 1960s.

Photo: Richard Revels

CONSERVATION OF THE WHITE-CLAWED CRAYFISH (*Austropotamobius pallipes*) IN THE COUNTY OF BEDFORDSHIRE

by Rebecca Longfield, Harvey Winter and Stephen Larkin

Introduction

Austropotamobius pallipes (White-clawed Crayfish) is the only species of crayfish indigenous to the British Isles. It is not known whether it is a relic from before the last ice age or if it colonised Britain from mainland Europe whilst they were still connected (Holdich, 1991). The species has been given protected status and was added to the 1981 Wildlife and Countryside Act, Schedule 5 in 1986; this relates to taking them from the wild and illegal sales. They are also listed in Annexes 2 and 5 of the European Union Habitats and Species Directive (92/43/EEC) which requires Special Areas of Conservation (SACs) to be set up to protect them. *A. pallipes* is also listed in Appendix III in the Bern Convention, which is the Convention of European Wildlife and Natural Habitats (Biodiversity Steering Group, 1995; Alderman & Wilkins, 1996).

Crayfish are smaller relatives of the lobster. They possess five sets of walking legs, of which the front set carries a substantial claw. The native species can grow between 5 – 8cm and is pale to dark brown or olive in colour; the common name, White-clawed Crayfish, is derived from the dirty white underside of the claws in the adults.

There has been a marked decrease in crayfish within the county of Bedfordshire with the majority of sightings being historical (Longfield, 1998; Winter, 1993). More recent sightings are reported by Winter (1993, 1994, 1996, 1998). The species' survival is threatened mainly due to the existence of the crayfish plague carried by the North American Signal Crayfish *(Pacifastacus leniusculus)*. The native species is very susceptible to this disease. Competition for space and food with the American Signal Crayfish has also become a problem. Many populations of non-native species, particularly *P. leniusculus*, have been introduced into the country leading to the demise of *A. pallipes* where the two come into contact. Habitat modification and pollution are other problems faced by the species.

Threats to *Austropotamobius pallipes*

Predation: Both terrestrial and aquatic animals predate on crayfish. Crayfish are most vulnerable during stages of moulting and also when they are juveniles. When the crayfish are small they are attacked by leeches and aquatic insects such as dragonfly nymphs (Holdich, 1991). When they are larger, fish such as Pike, Perch, Trout and Eel become predators along with Otter, Mink and the Grey Heron as the main terrestrial predators (Holdich & Lowery, 1988).

Human influence: Many habitats have been modified by man. The consequences of these actions means that populations of *A. pallipes* are destroyed (Holdich & Lowery, 1988). Some of the most harmful actions include channelisation, dredging, changing river beds, regulating water levels and reducing stream flow. Pollution is another problem, many populations having been destroyed through incidents involving agricultural waste and biocides (Holdich, 1991).

Competition: When non-native species are introduced into the wild and encounter the native species, *A. pallipes*, competition takes place for food and space. Unfortunately, native crayfish are smaller and less aggressive than the introduced species and therefore can be ousted from their habitat. Any stretch of river or a lake can only support a specific number of crayfish, known as its carrying capacity. Native crayfish are usually eliminated from a water body once this point is reached (Holdich & Reeve, 1991).

Disease: There are many diseases which affect the crayfish caused by bacteria, fungi and protozoa. Yet it is only one fatal disease that has caused the demise of this species in many locations.

Crayfish plague: The epizootic (animal epidemic) was brought over to Europe from North America in 1960. The disease has been able to spread due to the transportation of infected crayfish, fish and equipment. The Signal Crayfish acts a vector for the plague which is caused by a fungus. The spores of the fungus are released into the water by infected and dying crayfish. When a host is found it gets to work on breaking down the host's exoskeleton (shell). The infected crayfish behave abnormally. They are mostly nocturnal animals, but upon infection they begin to venture out during the day and even leave the water, their limbs begin to tremble and they walk high on their legs like stilts (Marren, 1986).

Plague spores can live in the mud on anglers' equipment, which is taken from river to river, and lake to lake. The spread of the plague by these means can be prevented as was shown by Alderman & Polglase (1985) who used an iodophor based disinfectant to treat all equipment placed in water; sodium hyperchlorite can also be used. The disinfectants kill the plague spores. The only problem is enforcing the use of these measures by anglers.

Survey

To conduct research on crayfish within the county, due to its protected status, a licence was required from English Nature to permit capture and handling of the species. Two types of trap were used (Longfield, 1998). Sampling locations were determined from previous observations and sightings. The traps were baited with either tinned cat food or kippers, something strong smelling to attract the crayfish. The traps were left overnight. On returning to the locations the traps were emptied and the length of the crayfish and its sex were determined. A stone turning exercise was conducted which entailed walking slowly downstream and turning stones, as these are typical hiding places for crayfish. All traps were re-used but only after they were disinfected along with any other equipment. Temperature and pH were also recorded whilst trapping. Only two locations fell outside the optimum limits for crayfish, suggesting the locations investigated were capable of sustaining a population of crayfish with respect to these two variables.

The traps were tested in an American Signal Crayfish farm and both types were successful, catching 13 crayfish in all, eight male and five female. However, in the wild results were very different. From setting 33 traps only one 'wild' crayfish was captured; unfortunately it was a male American Signal Crayfish of 8cm in length found in a

stream at Shillington. Sites with negative results are given by Longfield (1998) and summarised by Winter (1999). It is not uncommon for crayfish not to be discovered during investigations; for example a survey of the River Dean catchment in Cheshire was abandoned because of lack of crayfish evidence (Baldwin, 1997).

Crayfish are an elusive species and this result is therefore not conclusive evidence to suggest that the species is absent from any of the study sites. Research should continue on the White-clawed Crayfish within Bedfordshire. The plight of *A. pallipes* needs to be dealt with on both a national and local scale. Regulations are in place nationally, and there is a national action plan (Palmer, 1994) but this needs to be implemented locally. Appropriate action can be included within Local Environmental Action Plans (LEAPS) produced by the Environment Agency for river systems, but primarily within Biodiversity Action Plans (BAPs). They recommend action to be taken to conserve habitats and species within the local area, usually on a county by county basis. Biodiversity action planning for Bedfordshire is in progress (Bedfordshire Wildlife Working Group, 1997) and *A. pallipes* has been identified as a species requiring an action plan.

The county should be surveyed in depth; this would take a lot more time than allowed for in this research. Rivers should be taken in turn and sampled from their source downstream so as to prevent any spread of crayfish plague. Sampling areas along rivers should concentrate around bridges that traverse them. Stretches both up and down stream of the bridge should be investigated both manually and with traps. This methodology has been used in previous surveys (Rogers & Holdich, 1997). Following methodology that has already been used elsewhere will allow comparisons with other studies to take place. It would also be beneficial to do some night searching at the survey sites as crayfish are primarily nocturnal creatures.

Examples of sites to particularly concentrate on are the River Flit, River Ivel, River Ouzel, Elstow Brook and the Grand Union Canal at Linslade. All of these sites provide suitable crayfish habitat or have previously supported crayfish, so would be an appropriate starting point. Recording details of the environment at each site is important, such as bank features, depth of the water, type of flow, character of the river bed and vegetation type. Water quality parameters should also be recorded including temperature, pH, turbidity, dissolved oxygen, calcium content, conductivity and levels of nitrate, phosphate and potassium. All of these would give some indication of whether *A. pallipes* had disappeared because the environment is no longer suitable or whether the site is suitable for a possible re-introduction of the species.

Eradication: If non-native crayfish occur eradication could be a solution. At the present time nothing is known to selectively kill the species. In many circumstances non-native crayfish have been trapped and not returned to the water. This could be thought to reduce the numbers within a population. Unfortunately the adult males (which are more prone to be caught by traps) seem to have a controlling effect over the population. Crayfish are cannibals and predate on the young and defenceless. This will no longer occur if they are removed therefore allowing the juveniles to thrive (Gibson, pers. comm.).

Monitoring: Once a native population has been discovered it must be monitored to ensure that its habitat does not alter so as to make it inhospitable. Monitoring should take place after May but before October as crayfish are overwintering outside these times and tend to burrow far into the bank. Monitoring may also stress the female crayfish, which could have a detrimental effect if they are berried (carrying eggs).

Some attempts to expand the extent of the species have been made. The reason the population may be confined to a particular area may be because the area around is uninhabitable. Careful habitat modifications can be executed to make the surrounding area more hospitable. Crayfish require a supply of refuges such as stones, tree roots and rocks to enable them to hide from predators. An input of gravel and stones may be all that is required. Equally a complete modification may be needed. A dyke in High Wycombe had become shallow as silt had been deposited, reducing water flow. *A. pallipes* occupied the channel and were under threat because of the increased amount of silt. The objectives of the modification were to "retain the water level but increase depth and velocity in a self-sustaining narrower channel to improve the habitat for Crayfish" (RSPB, NRA, RSNC, 1994).

Weirs can also be constructed as an obstacle so that any non-native crayfish find it difficult to migrate up or down stream. Thought must be given to the actions taking place and the affect that any aspect of the new scheme, even throughout construction, may have on the native species. This is much greater if the native population is down-stream of any scheme. Action such as dredging could be detrimental to a population.

Not finding the native species: One option would be to re-introduce the native species. It would be better to re-introduce species into areas where they have previously occurred. This is, of course, if the habitat is still suitable for *A. pallipes* to survive. Information gathered during the sampling stage would be able to indicate if there is any threat to the species, such as poor water quality. The crayfish plague cannot be detected in the water. In other re-introductions caged native crayfish have been left in the water and fed for six months; if they live then the stretch of water is free from the plague. Consent is required from English Nature for re-introducing the species. Re-introductions are being carried out on the Rivers Test and Itchen in Hampshire. These are co-ordinated by Sparsholt College, Winchester, which is also the UK breeding unit for A. pallipes.

For a re-introduced population monitoring is of paramount importance. It would be ideal if the crayfish were marked in some way to enable identification during monitoring. Peay (1997) investigated various ways of marking them and recommended three alternatives. V-shaped notches can be cut into the uropods (tail) or a fluorescent polymer can be injected into the underside of one of the tail sections. They can be marked with Tippex® on the shell, but this is only used for short term monitoring as the marking is lost at the next moult.

The number of White-clawed Crayfish to be re-introduced into an area is dependent on the size of the area and the quality of the habitat. The carrying capacity for each stretch of river will differ. The number should not be too high otherwise a sudden introduction may have an adverse affect on the habitat as crayfish can destroy habitats.

The structure of the population to be re-introduced needs to be considered. The population needs to have a varied age structure (Hutchings, pers. comm.) and must mimic a natural population in as many ways as possible. It would be better to re-introduce after mating has taken place to ensure that the females in the population are pregnant (Lewis, pers. comm. to Gibson 1997), therefore adding juveniles to the population and increasing the age structure.

Ideally populations should be monitored annually for 5 years to ensure that the population has satisfactorily become self-sustaining and is healthy. Monitoring could continue after the initial 5 years but only bi-annually, mainly to ensure no invasion by non-natives.

Conclusion

The native White-clawed Crayfish is declining in numbers across the UK. This research has explored the historical records of *A. pallipes* within Bedfordshire. Also, fieldwork was conducted at various sites throughout the county in an attempt to locate a population of the species. With such a large area to cover not all the county could have been covered in such a small time scale. Areas were visited where previous sightings of the species had been noted.

A. pallipes has been found at two sites in the county in recent years (Winter 1996, 1998), so there is insufficient evidence to consider that the species is extinct, even if it was not found in this study. It is imperative that sampling continues. It is recommended that a strategy be adopted in Bedfordshire to assess the natural *A. pallipes* population and the extent to which non-native species have ousted the native.

Re-introducing the species into the county should be explored if suitable habitat can be located. If this is accomplished careful monitoring of the introduced population will be essential to ensure that the population does not follow in the footsteps of other populations that have occupied the site before it.

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SOCIAL WASPS
by Richard Revels

In general 1998 was not a good year for social wasps, with the cold late spring and early summer weather adversely affecting the aerial nesting wasps more than the cavity nesting species.

Hornet *Vespa crabro*

Our largest wasp the Hornet was again recorded in Bedfordshire during 1998. In the north of the county Tony Smith recorded it from near Stevington on the rail track (SP95R), and also from Odell Gt. Wood (SP95P), West Wood (SP96W) and from Harrold Park Wood (SP95J). Tom Thomas found an active nest in a cut wood store in West Wood (SP995623) on 2nd August 1998. A month later the nest was dead and mostly disintegrated. Under the nest remains were two grass snakes. Had these snakes destroyed the nest whilst looking for wasp grubs?

In the eastern side of the county Ian Woiwod, David Tyler and myself saw Hornets hunting for insects among flowers along the main ride in Potton Wood (TL253504), and Nigel Wood reported hornets at the RSPB reserve at Sandy (TL190480). Nancy Dawson again recorded Hornets from her garden in Ickwell (TL152455), and from the Swiss Garden at Shuttleworth, Old Warden (TL151445) and Wood Farm (TL136454). I saw some in the Southill area (TL147424 and TL144434), and Steve Williams reported several in Palmers Wood (TL14H). They seem to be well established in this area. For the first time I saw a Hornet along the Dunton to Ashwell Green lane (TL232421).

In mid Bedfordshire they were reported from Harlington (TL040305) by Lester Bull, and from Flitwick (TL035341 and TL029343) by Helen Butler. She also found a very old record dating from 1837 in the diary of Squire Brooks, who found a nest in the manor garden. Steve Williams saw a few in Chicksands Wood (TL14A). Vic Arnold sent me a record by Lyne Collings of a nest in the barn at Mauldon Wood (TL072387).

In the south Tom Thomas only reported two nests in Luton, both at the Mossman Collection, Stockwood Park, dealt with on the 5th August 1998. In October I recorded two queens flying just outside the Whipsnade Wild Animal Park enclosure (TL01D) while Cliff Tack was checking dormouse boxes in that area.

Mr & Mrs Greenhill had many records of Hornets in their garden and the nearby Birch Wood area of Luton Hoo. They had at least three Hornet nests in bird boxes in their garden.

Median Wasp *Dolichovespula media*

This wasp does not seem to be as common as it was a few years ago, the poor weather mentioned earlier probably being a major factor. I only occasionally saw it in my garden. I had nest records from gardens in Great Barford by Hereard Corley (TL128524), and from Mrs B. Chambers at Shillington (TL24H).

Tom Thomas treated about 20 nests of this species during 1998 in the Luton area.

Common Wasp *Vespula vulgaris* and **German Wasp** *Vespula germanica*

These were both, as always, seen widely. I had a nest in my garden of the Common Wasp which lasted until early November. Tom Thomas recorded nests of both these species from various places in Bedfordshire, and these wasps remain very common, apparently being little affected by the early summer cool wet weather.

I have not had any records of other species for 1998.

ACKNOWLEDGEMENTS

I should like to thank the following for sending me records:
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Richard Revels is the Society's Recorder for Social Wasps, a position he has held in an honorary capacity since 1994.

DRAGONFLIES
by Steve Cham

Heavy precipitation in the first half of April resulted in extensive flooding along the Great Ouse valley and its tributaries. It was the highest flooding for 150 years and reported to be the highest April rainfall on record. At Felmersham the waters reached the lakes in the nature reserve. The exact effects of flooding on dragonflies are unknown but it could lead to a redistribution of larvae which are entering the final stages of development. Most likely affected are species that would be emerging at the end of April and early May. In the case of Felmersham NR water levels were at their highest during May and June for many years. This will provide additional breeding areas for dragonflies.

Between mid February and early March there were a number of reported sightings of dragonflies on the wing at this exceptionally early time. These sightings coincided with a period of very mild weather, southerly winds and initially the arrival of Sahara dust. Most of the brief descriptions which accompanied these sightings were inconclusive when viewed in isolation. However a few were highly suggestive and combined with the weather conditions at the time it would appear that there was a large scale arrival of a North African species, the Vagrant Emperor, *Hemianax ephippiger*. A large blue-brown dragonfly was reported from a garden below Blows Downs during February. Although the dragonfly was not caught, this sighting coincided with this influx and was almost certainly *Hemianax ephippiger*.

Large Red Damselfly, *Pyrrhosoma nymphula*, was on the wing in Dorset in the last week of April and recorded in Epping Forest and Milton Keynes in the first weekend of May. In Bedfordshire it was not reported until the middle of May.

The weather in May was variable but some extended warm spells proved good for dragonflies. The first half of June was cold and wet and little activity was noted. One of the coldest June days ever was recorded. July proved equally variable with very little in the way of dragonfly activity for most of the month. It was particularly surprising to find Banded Demoiselle, *Calopteryx splendens*, still emerging in the second half of July. Poor weather persisted. September was cool and wet with some late species still on wing. October and November continued to be wet and cold and no late sightings were made.

Despite an overall poor year for dragonflies, two new species for the county were recorded; one a migrant and one a probable breeding species.

Scarce Chaser, *Libellula fulva*, was recorded at the two pits next to the A45 at Little Barford. This represents the first confirmed record for the county and the first for over 100 years. It is very easy to mistake *Orthetrum cancellatum* for this species with which it is often found. The new Bedfordshire colony is spread over several lakes and the River Great Ouse and extends over the county boundary into Huntingdonshire (VC31). About 6 or 7 adult males were observed on the Bedfordshire side resting on emergent and bankside vegetation. They were seen to clash with males of *Orthetrum cancellatum* and *Libellula quadrimaculata*. A follow up visit on 28th June further recorded males and females, along with a pair in cop. Later in the year nearly fully grown larvae were found in the river confirming that this is indeed a breeding population.

The Hairy Dragonfly, *Brachytron pratense,* range expansion continues both in Bedfordshire and Hertfordshire, where it was recorded at new sites. In the county it was again recorded from Felmersham during first week of May. Exuviae were found at several places indicating that it is now widespread throughout the site. At Priory Park several males were seen patrolling the margins of several of the Finger Lakes. A female was observed ovipositing in the dead floating stems of *Schoenoplectus* sp. It then flew up to catch a *Coenagrion puella* and settled in a tree to consume it. Recorded for the first time at Girtford Gravel Pit during a survey for the Ivel Valley Project. Recorded again at Bromham Lake NR by Peter Almond. Errol Newman reports that several were caught in mist nets set out for bird ringing at Priory Park. Recorded at the pits next to the A45 near Little Barford and at Chawston Pit. Recorded at the gravel pit next to the railway line at Radwell. This trend is expected to continue.

The White-legged Damselfly, *Platycnemis pennipes,* continues its range expansion along the River Ivel and River Flit. An unconfirmed sighting was made as far down as Flitwick sewage works.

Aeshna grandis: at Marston Thrift ponds during August a female was seen to break off from egg-laying to capture a male *Sympetrum striolatum.* Whilst perched she consumed the entire abdomen before flying off after being disturbed. The unfortunate Darter was still alive and managed to hold on to its perch for nearly 1.5 hours before perishing. A few days later the same observation was made but this time the Darter was caught by a male *Aeshna cyanea.*

I would like to thank all those who submitted records for the year. All records are entered onto the database.

Steve Cham is the Society's Recorder for Dragonflies, a position he has held in an honorary capacity since 1987. He is also national co-ordinator for the British Dragonfly Society's Dragonfly Recording Network.

Plate 5: The effect of the Easter 1998 flooding on butterfly populations is assessed in a study at Priory Country Park Bedford (p. 64). *Photo: Richard Revels*

Plate 6: The Common Blue, *Polyomattus icarus*, was nearly eliminated from Priory Country Park in 1998. Due to its colonial behaviour and pupation at or below ground level, it is very vulnerable to water-logging or flooding (p. 70). *Photo: Richard Revels*

Plate 7 (above left): Musk Orchid, *Herminium monorchis*, still recorded at Totternhoe Knolls (p. 84). *Photo: Richard Revels*

Plate 8 (above right): Man Orchid, *Aceras anthropophorum*, still recorded at Totternhoe Knolls (p. 84). *Photo: Richard Revels*

Plate 9: Greater Dodder, *Cuscuta europaea*, a nationally scarce species growing on its host Nettle, *Urtica dioica*. bank of River Ivel, near Blunham, 14.9.1998 (p. 84). *Photo: Chris Boon*

GRASSHOPPERS AND CRICKETS
by Kevin M Sharpe

1998 was yet another good year for new records. New squares are still being found for almost all the species. Dark, Roesel's Bush-cricket and Lesser Marsh Grasshopper have continued to spread in the county, along with Long-winged Cone-head.

Oak Bush-cricket *Meconema thalassinum*

Recorded in 24 tetrads from July to September, at SP92C, SP93R and W, SP95M, TL03H, R and W, TL04I, J, N and P, TL05A and Q, TL06Z, TL07Q and V, TL11P, TL14B, G, H, I and L, TL15Y and one previously unrecorded tetrad of:

TL14W – Langford Wood

Dark Bush-cricket *Pholidoptera griseoaptera*

Recorded in 48 tetrads from 10th June to 17th November at SP95M, TL03F, G, H, L, R, S and X, TL05A, TL06J, N, P, S, T, X and Z, TL07R, TL11I, TL14B, C, D, G, H, I, J, L, P, S and T, TL15Y and with 18 previously unrecorded tetrads of:

SP93R/W – Eversholt Lake
TL02L – M1 Luton; TL02R – Railway, Luton;
TL02W – Wardown Park, Luton
TL03B – Tingrith; TL03C – Steppingley
TL06U – Tilbrook
TL07F – Hargrave, A45
TL12C/D – Butterfield Green
TL14U – Sandy, A1; TL14V – Henlow and Langford Commons;
TL14W – Langford Common
TL15X – Little Barford
TL23E – footpath to Astwick; TL23I – A1
TL24A – Topler's Hill

Roesel's Bush-cricket *Metrioptera roeselii*

Recorded in 94 tetrads from 26th July to 1st November at SP93R and W, SP94F, Q, V, TL02N, T, U and Z, TL03B, C, F, H, K, L, N and Q, TL04K, TL05J, TL11I, TL12B and C, TL15S and T, TL23I, TL24A and with 67 previously unrecorded tetrads of:

SP95U – Yelnow Lane and Wood
SP96V – Souldrop, A6; SP96W – West Wood, A6
TL03R – Kitchenend Farm; TL03S – Silsoe; TL03W – Fielden
TL03X – Wrest Park
TL04D – Green End; TL04E – Willington, A603; TL04J – Kempston;
TL04L – Thickthorn; TL04P – Bedford Railway
TL05C/D – A6, Milton Ernest; TL05E – A6, Radwell Pit;
TL05P – Thurleigh; TL05V – Priory/Willington footpath
TL06A – A6, road verge; TL06E – old airfield and the old A45;
TL06F – bye-road verge; TL06J – Shelton; TL06K – Thurleigh Airfield;
TL06L – Riseley; TL06M/S – Swineshead; TL06N – Upper Dean;
TL06P – Lower Dean; TL06T – Tilbrook Bushes; TL06U – Tilbrook;
TL06X – B660, Pertenhall; TL06Y – B660, Wood End; TL06Z – Kimbolton
TL07F – Hargrave; TL07K – Three Shire House; TL07Q – bye-road;
TL07V/W – B660, road verge

TL12A – Luton Airport; TL12B – Stopsley; TL12C/D – Butterfield Green;
TL12G – Wigmore
TLI3B – Higham Gobion
TL14B – Warden's Wood; TL14J – Hill Farm;
TL14M – Shuttleworth Collection; TL14N – Northill;
TL14P – Moggerhanger; TL14R – Broom; TL14S – Upper Caldecote;
TL14T – Seddington; TL14U – A1, Sandy; TL14X – Biggleswade
TLI5K – Blunham; TL15M – A428, Roxton; TL15U – A1, Eaton Socon;
TL15X – Hill Farm; TL15Y – Little Barford
TL16C – Pertenhall Hoo Farm; TL16D – Gimbers End; TL16Q – Duloe
TL23C – A507; TL23E – A1; TL23H – A507/A1M
TL24B – Al; TL24C – East Biggleswade; TL24D – B1040

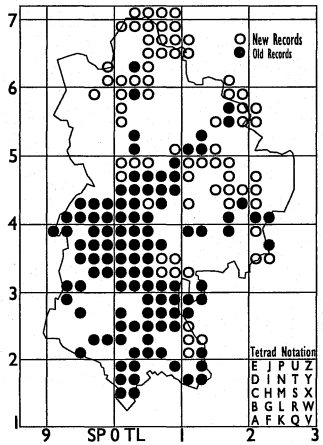

Fig. 1 Distribution of Roesel's Bush-cricket, *Metrioptera roeselii*, in Bedfordshire

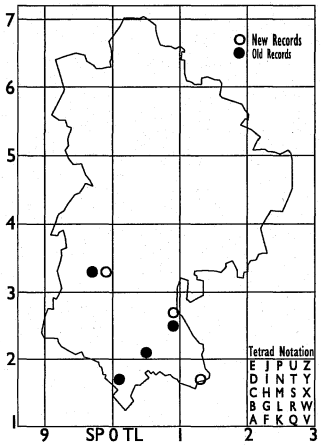

Fig. 2 Distribution of Long-winged Cone-head, *Conocephalus discolor*, in Bedfordshire

Long-winged Cone-head *Conocephalus discolor*

Recorded in four tetrads from July to September, at SP93R, (2 males and 1 female were found) and with three previously unrecorded tetrads of:

SP93W – Eversholt Lake, 1 male
TL02Y – Galley Hill, 1 male
TL11I – East Hyde Sewage Works, 2 males

Speckled Bush-cricket *Leptophyes punctatissima*

Recorded in 30 tetrads from July to September at SP92C, SP93W, TL03R, W and X, TL04N, TL05A, TL06T and Z, TL11I, TL12C, TL14G, H, I, L, P, Q, U, V and W, TL15Y, TL23E and D, TL24A, TL25C and D, with four previously unrecorded tetrads of:

SP93R – Eversholt Lake
TL03B – Home Farm/Tingrith
TL06U – Tilbrook
TL23I – Stotfold

House Cricket *Acheta domesticus*

Recorded in five tetrads in August and September at TL03F, H and S, TL14X and with one previously unrecorded tetrad of:

TL14M – Shuttleworth Collection

Slender Ground-hopper *Tetrix subulata*

Recorded in four previously unrecorded tetrads from July to October at:

SP93W – Eversholt Lake

TL03B – Tingrith; TL03X – Wrest Park

TL14M – Swiss Cottage

Common Ground-hopper *Tetrix undulata*

Recorded in two previously unrecorded tetrads from June to September at:

TL03X – Wrest Park

TL14H – Palmer's Wood

Common Green Grasshopper *Omocestus viridulus*

Recorded in one tetrad in September at TL05F.

Field Grasshopper *Chorthippus brunneus*

Recorded in 40 tetrads from June to 5th November at SP93W, TL02W,TL03A, B, C, F, G, H, L, R, S, W and X, TL05F, TL06P and N, TL11I, TL12C, TL14G, L, P, Q, R, S, T, V, W and X, TL15U, X and Y, TL16Q, TL23D, E, I and J, TL24A and with two previously unrecorded tetrads of:

TL06E – old airfield; TL06T – Tilbrook Bushes

Meadow Grasshopper *Chorthippus parallelus*

Recorded in 15 tetrads from 9th May to 1st November at SP93R and W, TL03A, B, C, H, L, R,W and X, TL04I, TL05F, TL07V, TL11I, TL14D and with no new tetrads found.

Lesser Marsh Grasshopper *Chorthippus albomarginatus*

Recorded in 43 tetrads from 20th July to 3rd November at TL03S and X, TL05F, TL06E, J, P, N, S, U and X, TL14C, D, J, P, Q, R, S, U and X, TL15U, X and Y, TL16C and Q, TL23I and J, TL24A and with 15 previously unrecorded tetrads of:

SP93R/W – Eversholt Lake

TL03B – Tingrith; TL03C – Steppingley; TL03F – Harlington

TL03G – Westoning; TL03L – Higham Bury; TL03W – Fielden

TL06T – Tilbrook Bushes

TL07K – Three Shire House

TL14B – Warden's Wood; TL14T – Seddington; TL14V – Henlow/ Langford Common

TL23D – Stotfold; TL23E – Astwick footpath

Mottled Grasshopper *Myrmeleotettix maculatus*

Recorded in only one tetrad in August at TL03J.

Striped-winged Grasshopper *Stenobothrus lineatus*

Recorded in only one tetrad on 22nd August at TL02Z and 23 different ones were recorded at the site.

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Kevin Sharpe is the Society's Recorder for Grasshoppers and Crickets, a position he has held in an honorary capacity since 1992.

BUGS (Hemiptera-Heteroptera)
by Bernard Nau

In 1998 there were again just two additions to the County List, as in 1997, the latter being down on the exceptional number in 1996. The first is an inconspicuous bug, *Temnostethus pusillus*, overlooked previously as it has since been found widely in the county in most places where Ash trunks have been checked. More conspicuous and colourful is *Deraeocoris olivaceus*, a species of Hawthorn. Sheila Brooke found the first two in a short lunchtime bug-hunt at a site at Slip End, near Luton. I visited the site next day and found several more, but it was not common. Although one or two were found elsewhere it seems possible that the season was already nearly over. This bug was first recorded in Britain in 1951 and is now known from six counties in SE England. Bedfordshire is a northern extension to its range.

Among the more interesting records were several of Shieldbugs or near relatives. After an hour or more searching suitable places on fallow at Pegsdon Hills NR I found three *Sehirus luctuosus* near Forget-me-not on 19th May; I also saw a *Thyreocoris scarabaeoides* here, the first I have seen not on downland. Five adult *Dolycoris baccarum* on 31st August at Sandy Heath Quarry indicate that this species has now spread completely across the county, from west to east. A specimen of *Ceraleptus lividus* in rough grass at Willington Quarry on 24th September is only the 2nd in the county. Three specimens of *Coreus marginatus*, on dock seed-heads at the Bromham landfill site on 25th September, are the most northerly yet seen in the county.

A 2nd site was also found for *Orsillus depressus*, beside the former railway track at Willington, 3rd–5th instar nymphs were common here on Lawson Cypress on 24th September. *Cardiastethus fasciiventris* was recently added to the county list from Ampthill Park and more were seen here this year, nine on Gorse on 25th June. There was also a 2nd record of *Teratocoris antennatus*; a female at Flitwick Moor on 16th July was in the same *Carex rostrata* swamp as the 1st, about twenty years earlier. The swamp has much deteriorated due to encroaching Reedmace, Alder, and Birch .

Before leaving plant-bugs I should mention that I tried to refind *Megacoelum beckeri*, reported in 1960 by Leston, from Scots Pine at Millbrook and Woburn Sands. Despite an intensive search of Scots Pine of all ages at Shire Oak Heath (Heath & Reach), on 28th August, I could not find any sign of this large bug.

Moving on to water-bugs, it was interesting to find *Ranatra linearis* already in a new pond on the golf course under construction south of Biddenham village, 1st August. *Gerris gibbifer* is an under-recorded water-boatman in the county; on 24th July there were three in a galvanised cattle-trough in a meadow adjoining Wavendon Heath. On 13th October the lagoons east of Elstow, beside the bypass, produced the first Bedfordshire specimens of the water-boatman *Sigara limitata* since Brown recorded it in the same part of the county in 1948. Also at Elstow on 13th October was *Hesperocorixa moesta;* Brown also recorded this rather local species in 1948, from a clay-pit at Stewartby.

ADDITIONS TO THE COUNTY LIST

Anthocoridae

Temnostethus pusillus (Herrich-Schäffer)

21st June 1998 one on trunk of an Ash tree at Linslade (vice-county Bucks), subsequently on Ash trunks at a dozen sites widely distributed across the county.

Miridae

Deraeocoris olivaceus (Fabricius): [RDB 'Notable']

On 6th July 1998 Sheila Brooke found a male and a female on a Hawthorn hedge beside the M1 motorway at Slip End, Luton; next day I found 3 females and 2 males here and, with SEB, a male at Chalton Sewage Works. On 10th July at Whipsnade Green I found a single female after a 45 minute search, but none at all at several other sites in the south of the county.

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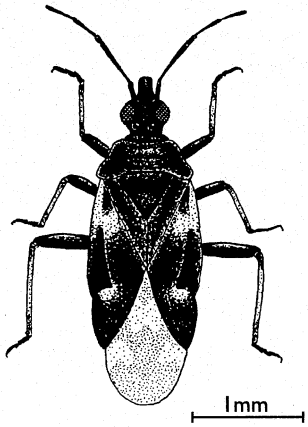
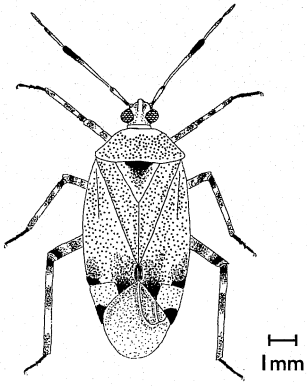
I am grateful to the members who have kindly provided me with records during the year, and especially Sheila Brooke for finding the first *D. olivaceus*, as well as a large number of other records.

Bernard Nau is the Society's Recorder for Bugs (Heteroptera), a position he has held in an honorary capacity since 1971. He is also organiser for the national recording scheme for terrestrial Heteroptera.



Temnostethus pusillus



Deraeocoris olivaceus

BUTTERFLIES
by Charles Baker

General

A mild day on 9th January brought the first sightings of butterflies, a Peacock in Sharnbrook (SMM), Small Tortoiseshell in Potton (JEC) and a Red Admiral in Bedford Park (VKJ) and further individuals were seen on mild days during mid-February, especially between 13th and 15th. The heavy rains during April resulted in flooding along the valley of the Great Ouse. The effects on butterfly numbers in Priory Park, Bedford where parts of the transect route were submerged to a depth of 1m or more have been analysed by Brian Anderson and are included in a separate article in the Journal (p. 64). Although the weather during the season seemed poor compared with recent warm summers, it was close to average apart from some spells of exceptionally heavy rainfall. Butterfly numbers seemed correspondingly low, but from the figures available to date some species seem to have done better and others less well as might be expected.

Identifying changes in numbers of butterflies in Bedfordshire from year to year relies heavily on the regular counts and transect walks. The hard work of everyone involved is gratefully acknowledged. However, due to various problems some transects were covered less completely than in previous years and the results from others were not available in time for this report. So comparisons made in previous years will not be included here.

In 1998 more than 80 people recorded sightings of butterflies in Bedfordshire. These sightings contribute valuable information on changes in distribution, numbers and flight times. This is the first year for which at least a substantial number of the records (more than 6,000) have been entered onto computer. Because of the time spent entering the large backlog of earlier records for the national Millennium Atlas it has not been possible to enter all the transect data in time for this report but these relate to very few sites. Hopefully, as the backlog is cleared, entry of records will become more complete in future years. Nevertheless, having most of the 1998 records readily accessible on computer has revealed several aspects that would have been difficult to unearth from the heap of paper. It is also easier to produce lists of species for individual sites. Butterflies were reported in 1998 from every 10km square in the county except for the tiny area in TL07. The number of tetrads and 1km squares for which records have been received to date can be totalled for each species. This is not a figure that will be comparable from year to year as it is influenced strongly by the overall recording effort and the visibility of the species. Thus the fact that Purple Hairstreak, which almost certainly occurs in most oak woods in the county, was seen in only 14 1km squares probably reflects the difficulty in seeing it in this particular season rather than a dramatic decline in its range. Nevertheless, sightings of Clouded Yellow in 24 squares, Painted Lady in 31and Red Admiral in 90 do give an idea of the spread of these very visible immigrants. The six most widely seen species were Green-veined White (194), Large White (182), Meadow Brown (167), Gatekeeper (147), Peacock (137) and Holly Blue (135 1km squares).

Skippers

Small Skipper *Thymelicus sylvestris* and **Essex Skipper** *Thymelicus lineola*

Both species were seen widely. On 25th July some 250 Essex Skippers were counted on Knapweed flowers on the verges of Woodhouse Lane, Duloe (CB & BSN) and more than 60 along footpaths in the Knotting Green area on 1st August (CB & DVM).

Large Skipper *Ochlodes venata*

Widespread and quite abundant in some woods particularly Maulden Wood (J&DB), Wilstead Wood (JCA) and Yelnow New Wood (S&IK). Very large numbers were present in Chicksands Wood in late July and early August (JCA).

Dingy Skipper *Erynnis tages*

Remains local but continued to do well on its main downland sites including Barton Hills, Sharpenhoe Clappers and Totternhoe Knolls and Quarry. The clay pits in the Marston Vale also continued to be a focus for this species but the proposed development at Elstow Storage Depot will almost certainly remove the habitat there for both this and the next species.

Grizzled Skipper *Pyrgus malvae*

Present in its chalk downland sites and some were again seen in the clay pits in the Marston Vale (KMS, RAN). The sighting in Chicksands Wood on 20th June (DP) was the first for many years. An even later one was seen at Yelnow Farm on 7th July (JM). The strongest colony in the county appears to be on private land at Waterloo Thorns where 51 were counted on 20th May (CB & RCR).

Swallowtail *Papilio machaon*

One was photographed in a garden in Arlesey on 8th May (SO). Although the early date suggests that this was a captive-bred individual, the possibility of a small immigration from the Continent cannot be ruled out. Another was reported in Essex at about the same time.

Whites

Wood White *Leptidea sinapis*

Again no reports have been received of Wood White being seen. None were seen in Maulden Wood despite several visits during the flight period. It may well be extinct in the county. A report by Oates and Warren (1990), seen only recently, alleged that the Wood Whites in Maulden Wood originated from a release in 1974. It is possible that most if not all of the recent sightings elsewhere have been of captive-bred butterflies that somebody has released. It seems that there is very little habitat in Bedfordshire that is optimal for Wood White. Casual releases into unsuitable habitat serve only to distract from the more important task of developing good habitat where the species can flourish long term.

Pale Clouded Yellow *Colias* sp.

A butterfly which appears likely to have been a "Pale Clouded Yellow", rather than the *helice* form of the Clouded Yellow *(C. croceus)*, was seen briefly at close range, both in flight and settled, in Priory Park, Bedford on 16th September (EN). The two species of "Pale Clouded Yellow" (Pale Clouded Yellow *C. hyale* and Berger's Clouded Yellow *C. alfacariensis)* cannot be separated on the wing so the identification must remain uncertain in this instance.

Clouded Yellow *Colias croceus*

A good though not a really remarkable year for this migrant species. Reported on over 30 occasions from 24 1 km squares across the whole county. The first report was from Deepdale on 18th May (BF) followed by a number of sightings in June. The subsequent generation was flying from late July until the end of September. Although most sightings were of single individuals, it is interesting that as in 1996 the two sites where several were seen together were Bromham Lake Nature Reserve (PA) and Ledburn Pit (GD). The white *helice* form of the female was seen at Sharpenhoe Clappers (DC), Wrest Park (DC), Sundon Quarry (RCR) and Bromham Lake Nature Reserve (PA).

Brimstone *Gonepteryx rhamni*

Widespread and, although mostly seen in small numbers, 17 were counted on 9th May on Sharpenhoe Clappers (DC), 10 on Whipsnade Downs on 17th May (DC), 15 on 8th September on Sharpenhoe Clappers (DC) and 25 on Pegsdon Hills (SP) on 20th September.

Large White *Pieris brassicae*

Common and widespread with especially large numbers in Chicksands Wood in early August (JCA).

Small White *Pieris rapae*

Distributed widely though not particularly common. Large numbers were present in Chicksands Wood (JCA) and in oil-seed rape fields near Wrestlingworth in early August (CB).

Green-veined White *Pieris napi*

Generally more common and widespread than the Small White. In late July and early August numbers were high in some woods such as Chicksands Wood (JCA), Halsey Wood (HAS) and Hanger Wood (PA).

Orange Tip *Anthocharis cardamines*

As usual most sightings are of the males which are highly visible flying alongside roads and paths. Widespread but mostly seen in small numbers though 8 were seen in one visit near Souldrop on 15th May (HAS) and at Sewell cutting on 17th May (DC).

Hairstreaks

Green Hairstreak *Callophrys rubi*

This very local species was seen in its usual downland sites and in the Marston Vale. It is another species threatened by the proposed development at Elstow Storage Depot. No records were received from the Greensand Ridge this year.

Purple Hairstreak *Quercusia quercus* and **White-letter Hairstreak** *Satyrium w-album*

Both these species were under-recorded in 1998 and were not seen in large numbers anywhere. A new site for White-letter Hairstreak was found near Turvey (JM).

Black Hairstreak *Satyrium pruni*

Several were seen in Marston Thrift 21st–24th June (A&CB, CB, RAN, LC) but the flight period appears to have been short as none were seen on 7th July despite an intensive search by several people. Permission to visit Wootton Wood, which is privately owned, resulted in one sighting (CB). One was seen there in 1995 so this sighting confirms the existence of at least a small colony on the abundant blackthorn there. Several hours of watching in Holcot Wood were rewarded with a fleeting glimpse of a hairstreak over blackthorn (CB) but its presence there remains to be confirmed in future years.

Coppers, Blues and Metalmarks

Small Copper *Lycaena phlaeas*

Sightings scattered through the county but in small numbers.

Small Blue *Cupido minimus*

Few reports this year but present in good numbers on the cliff slopes north of Totternhoe picnic site (RK). It was seen on the transect route on Sharpenhoe Clappers (DC) for the first time since the transect was started in 1995.

Brown Argus *Aricia agestis*

Although still widespread, numbers were again well below the peak of 1995-6.

Common Blue *Polyommatus icarus*

Reported throughout the county but not often abundant. Away from the chalk downs, Bromham Lake Nature reserve was one of the best sites with more than 30 being seen on 3 occasions in August (PA).

Chalkhill Blue *Lysandra coridon*

Apart from the occasional wanderer, this butterfly is confined to the chalk where it was again abundant on some sites though numbers generally down on 1997. Through the season 1,221 were counted on Barton Hills (DW) and 1,029 on Sharpenhoe Clappers (DC).

Adonis Blue *Lysandra bellargus*

Perhaps the greatest surprise of 1998 was the report (Kemp, 1999) of Adonis Blue breeding at an undisclosed locality in south Bedfordshire. The report refers to sightings of adults of both broods. Although not impossible, it seems highly unlikely that this species could have survived unreported for nearly 40 years since the last record in the county. A release seems the most likely explanation. Hopefully, surveys in future years will reveal whether it is present in more than one area.

Holly Blue *Celastrina argiolus*

Surprisingly widespread and common despite the apparently high levels of parasitism in 1997. Of the dated records received so far, 182 were for the first generation (March to the end of June) and 120 for the second generation (July to September). Of larvae collected by R.C.Revels in the spring of 1998, 45 out of 50 were parasitised.

Duke of Burgundy *Hamearis lucina*

Very local (3 1km squares only) but seemed to be doing well on Whipsnade Downs though few were seen in Totternhoe Quarry.

Nymphalids

White Admiral *Ladoga camilla*

Present in the usual woodland sites but in smaller numbers than in 1997. On 16th July one was watched by several people flying round the car park at Stockgrove Country Park at 7.30 pm.

Red Admiral *Vanessa atalanta*

The butterfly seen in Bedford Park on 9 January (VKJ) was probably an over-wintering individual. The next batch of sightings was at the end of March and early April. Subsequently seen widely, mostly in small numbers, though late summer flowers such as Sedum and Ivy attracted more.

Painted Lady *Cynthia cardui*

The first sighting of the year was on 19th March on Wavendon Heath (RAN), exceptionally early for this species. Others were seen in southern England during March suggesting an early immigration (Bowles, 1998). However, a report from Cornwall (Wacher, 1999) of the reappearance in spring of an individual marked the previous autumn indicates that the occasional individual may survive the winter. The next sightings were towards the end of June. These probably bred locally producing the butterflies seen in August and September. Overall more were reported than in 1997, scattered throughout the county mostly as singletons.

Small Tortoiseshell *Aglais urticae*

Widespread but common in only a few places.

Peacock *Inachis io*

Also widely distributed and often seen in larger numbers than the previous species. On 8th August 100 were counted in Marston Thrift (GW) and 70 in Studham on 11th August (CB). Large nests of larvae could be found, especially in Chicksands Wood at the end of June (JCA). Hibernating butterflies were again found during surveys of bat hibernation sites (CC).

Comma *Polygonia c-album*

Widely scattered through the county and mostly seen in small numbers. Single larvae were found on Wych Elm in Wilstead Wood on 21st June and Marston Thrift on 24th June (CB). Although well-known as a foodplant, these appear to be the first records for Bedfordshire.

Fritillaries

Dark Green Fritillary *Argynnis aglaja*

This species was seen on Barton Hills, Barton Quarry, Pegsdon Hills, Moleskin and Sharpenhoe Clappers although not as frequently as in 1997. Several females were again seen. Hopefully a sighting on Sharnbrook Summit on 27 July (JM) will herald a return to this site.

Silver-washed Fritillary *Argynnis paphia*

No reports were received in 1998 but on 20th July several males were seen flying in a Buckinghamshire wood (CB) only 24km from the Bedfordshire border.

Browns

Speckled Wood *Pararge aegeria*

Seen widely through the county and common in some woods, especially Maulden Wood (J&DB, CB) and also in Chicksands Wood at the end of June (JCA). Numbers were up on some downland transect sites.

Wall Brown *Lasiommata megera*

After the extreme scarcity in 1997 it is good to be able to report sightings in 17 squares, mostly along the chalk downs and in the Marston Vale. The largest number seen on one occasion was 12 in Coronation Pit where a total of 87 were recorded during the year (KMS).

Marbled White *Melanargia galathea*

Seen in many parts of the county except the extreme east and north-east. A single individual on the east side of Henlow on 24th July (CB) is probably the most easterly sighting in the county in recent years. More than 20 individuals were seen flying at two new sites in the Leighton Buzzard – Heath and Reach area (PS).

Gatekeeper *Pyronia tithonus*

Widespread but rather less common than in 1997. In Hill Rise Nature Reserve in Bedford, where Brian Anderson has been studying its ecology, numbers were 34% up on those in 1997. Present in its usual large numbers in Chicksands Wood (JCA).

Meadow Brown *Maniola jurtina*

Remains very common and widespread. Away from the chalk, high numbers were seen on Bromham Lake Nature Reserve (PA), Maulden Wood (J&DB) Yelnow New Wood (S&IK) and in Studham (CB), though counts were slightly down on some sites compared with 1997, particularly at Priory Park (RB).

Ringlet *Aphantopus hyperantus*

Also remains widespread and common though probably under-recorded in the north-east. Large numbers in Chicksands and Wilstead Woods in July (JCA).

Small Heath *Coenonympha pamphilus*

Seen more widely across the county than expected and locally common.

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THE EFFECT OF THE EASTER 1998 FLOODS ON THE BUTTERFLY POPULATIONS OF PRIORY COUNTRY PARK, BEDFORD

by Brian Anderson and Roy Bates

Introduction

Easter 1998 saw the worst flooding in the valley of the Great Ouse for many years. Among the areas affected in the neighbourhood of Bedford was Priory Country Park. The extent, depth and duration of the flooding were such that at least some of the butterfly species were likely to be affected adversely during the 1998 recording season.

A simple method of scoring the vulnerability of each species to flooding, and the mobility during one season, was devised as a "predictor" for the degree to which the index of abundance might have been affected. This predictor, or recovery indicator (RI), was tested with various groups of data: (a) Priory against data from other sites; (b) Flooded against unflooded areas within Priory; (c) various sets of data representing relative brood sizes and mean flight dates.

The data show clearly that the Common Blue was very nearly eliminated from Priory, and four other species with high RI scores showed greater declines at Priory than elsewhere. Conversely, four other species with high RI scores showed smaller decreases than at some other sites or actual increases in abundance. One species, the Peacock, which was presumed from its low RI score to have been relatively unaffected by the flooding showed a marked difference in abundance change between flooded and unflooded areas i.e. a small decline as against a large increase respectively. The Large White, another low RI score species, showed the rather counter-intuitive result of doing rather better in flooded than unflooded areas.

Design of the study

The 1997 data were obtained from Herbert (1997) and for 1998 from Baker (1998 pers. comm.), Gregory (1998 pers. comm.) and from the authors' own data.

(i) Priory compared with other sites

It was decided to limit the other sites included to those within the geographical boundaries of Bedfordshire to ensure that the weather over the 1997 and 1998 seasons was similar for all sites, effectively removing one variable from the comparative data. Abundance and weekly mean data (Pollard & Yates 1992 pp. 10–20) were obtained from sites where a consistent and regular transect was walked in both 1997 and 1998. Due to the poor weather during the 1998 season, more use than usual had to be made of interpolated data. The sites are listed at Table 1. Although a potential ten sites should have been available for comparison, problems with the supply of data has meant that only four sites are included for numerical comparison, together with some largely qualitative data from a fifth.

(ii) Comparison of flooded and unflooded areas within Priory

The extent, depth and duration of the flooding were determined (Newman 1998, pers. comm.) and compared to a site map (Figure 1). The weekly mean counts and abundance indices for the flooded and unflooded areas were then compared.

Study site	Comparison sites	Grid reference
Priory Country Park		TL0749
	Hill Rise LNR	TL0451
	Parkwood LNR	TL0452
	Sharpenhoe Clappers	TL0630
	Totternhoe Quarry	SP9822
	Whipsnade	TL0018

Table 1. Sites included in the study

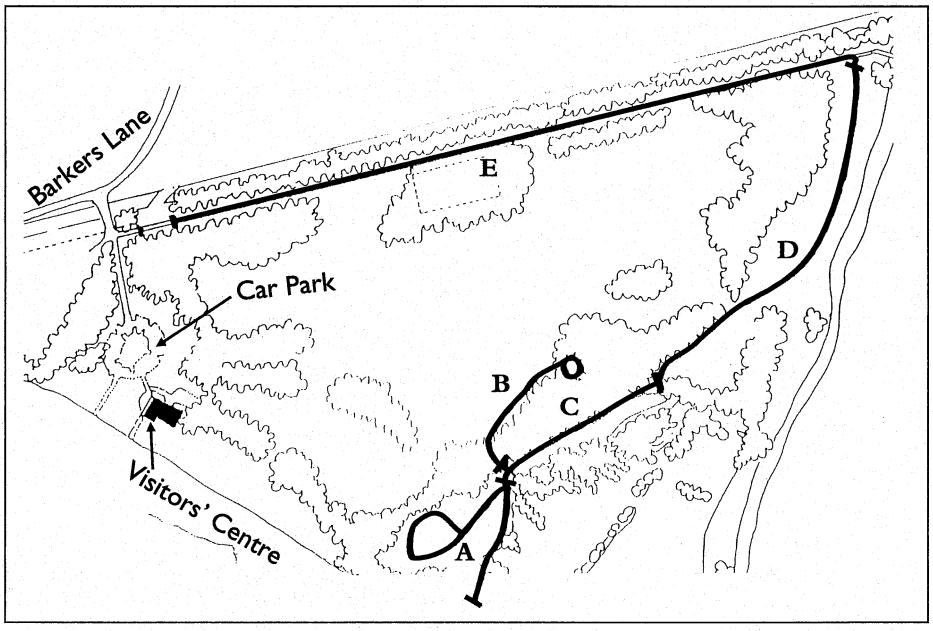

Fig. 1 The butterfly transect at Priory Country Park, Bedford

(iii) Mean flight date and relative brood size

Where appropriate, data on the mean flight dates and relative brood sizes of various species were used in an attempt to quantify such features as single season mobility and second or third brood recovery of populations.

(iv) The scoring method

A "recovery indicator" score (RI) was calculated by adding scores for presumed vulnerability to flooding (V) and single season mobility (M). Note that the higher the value of RI, the greater is the predicted effect on the species considered.

The V score was based on the overwintering development stage and normal location of each species. Thus, a species that overwinters as an adult and typically at some location high off the ground will have a lower V score than one which overwinters as a larva at ground level. The V score method is enumerated in Table 2.

Overwintering stage	Overwintering height above ground	Vulnerability (V) score
Adult*	Over 1 m	1
Egg, larva, pupa	0.5 to 1 m	2
Egg, larva, pupa	0.1 to 0.5 m	3
Larva, pupa	At or below ground level	4

**It might be argued that many overwintering adults would have been on the wing by April, but since the roosting sites are similar to the hibernating sites, no difference has been presumed. In addition, the Red Admiral has been given a V score of 0, since the majority of those seen in the spring are immigrants.*

Table 2. The V score numbering system

The single season mobility score (M) is based loosely on the concept of open and closed populations (Warren 1992). Although this concept has been largely abandoned in favour of metapopulation theories, it is reasonable to argue that it still has validity for short periods of time (days to months) and limited areas or short distances. Table 3 shows the single season mobility scoring method.

Mobility characteristic	Mobility (M) score
Strong-flying species with migratory reinforcement	1
Strong-flying species with open population	2
Loosely colonial species	3
Tightly colonial species	4

Table 3. The M score numbering system

The resulting calculation of RI scores is given for each species in Table 4.

Species	Vulnerability score (V)	Mobility score (M)	Inverse apparency score (RI = V + M)
Small/Essex Skipper	3	4	7
Large Skipper	3	4	7
Brimstone	1	2	3
Large White	1	1	2
Small White	1	1	2
Green-veined White	2	2	4
Orange Tip	2	2	4
Common Blue	4	4	8
Holly Blue	4	2	6
Small Tortoiseshell	1	1	2
Comma	1	2	3
Peacock	1	2	3
Red Admiral	0	1	1
Speckled Wood	3	3	6
Gatekeeper	3	3	6
Meadow Brown	3	3	6
Small Heath	3 – 4	4	7 – 8

Table 4. The recovery indicator scores (sum of V and M scores)

The details of the overwintering stage were derived from various field guides (South 1956, Sandars 1939, Thomas 1989 and Thomas & Lewington 1992) and from various contributions to Dennis (ed.,1992). The data on mobility are taken largely from Warren (1992) and Thomas & Lewington (1992).

(v) Statistics

The statistical constraints have been kept to a very simple level. Where the sampling error between any pair of samples was greater than apparent change in the populations, it was presumed that the apparent change was a sampling effect. For any species at any site to be included in the study, the sample in either 1997 or 1998 had to be at least 20, which limited the sampling error for at least one year to 22.4 per cent. The "observer" effect (Anderson 1998) was presumed minimal because the same recorder did the recording for both years at each site.

The possibility of using a diversity index to examine integrated changes at each site was examined, but was rejected due to the low number of species present at even the richest sites (Woiwod 1998, pers. comm.).

Results

(i) The extent of the flooding and other meteorological data

Referring to Figure 1, Table 5 below gives the estimated depth of flooding at Priory. The duration of the flooding was slightly in excess of a week for the deepest water areas.

Transect section	Mean depth of flooding (m)
A	2.4
B	Waterlogged but no open water
C	0.6
D	0.6
E	Unflooded

Table 5. Estimated depth of flooding at Priory Country Park, Easter 1998

E. Newman (pers. comm.) has kindly supplied us with weather data recorded at Goldington (about 1 – 2 km away). There is nothing in this data that suggests that other meteorological phenomena had any significant effect on the populations at Priory that was not equally applicable to the comparator sites.

(ii) Priory compared with other sites

Table 6 below shows the percentage change between 1997 and 1998 for each species with an index of abundance of at least 20 in at least one of the years. "n/a " indicates that this condition was not met for that species at that site.

Of the species listed above that have an RI score of 6 or greater, the effect of sampling errors on three individual species, Large Skipper, Holly Blue and Speckled Wood, is large enough to suggest discounting any real difference between the sites. However, this topic is examined more fully in the discussion below.

Species	Site and percentage change 1997–98					
	Priory	Hill Rise	Whipsnade	Sharpenhoe	Totternhoe	RI score
Small/Essex Skipper	-74	n/a	-61	-55	n/a	7
Large Skipper	-46	n/a	-17	36	45	7
Brimstone	5	n/a	-17	177	45	3
Large White	27	57	66	-10	-39	2
Small White	-27	-47	-55	-72	-56	2
Green-veined White	-19	0.00	99	-7	n/a	4
Orange Tip	-21	n/a	-75	n/a	-43	4
Common blue	-99	-36	-88	66	-58	8
Holly Blue	-51	-48	35	-3	n/a	6
Red Admiral	170	n/a	700	n/a	n/a	1
Small Tortoiseshell	-63	-86	-87	-76	-7	2
Peacock	40	-40	-54	0	-7	3
Comma	176	n/a	n/a	n/a	n/a	3
Speckled Wood	10	n/a	-71	35	3	6
Gatekeeper	-24	35	-47	-44	-39	6
Meadow Brown	98	79	31	33	6	6
Small Heath	-77	n/a	-48	-31	-42	7–8

Table 6. Comparing Priory with other sites 1997–98

(iii) Comparing flooded and unflooded areas at Priory

Table 7 gives the comparative data between the flooded and unflooded areas at Priory between 1997 and 1998. Table 5 shows the extent of flooding, and for this analysis sections A, C and D are taken as flooded and B and E are unflooded, although section B is described as waterlogged. This also will be discussed below.

Species	Mean change flooded	Mean change unflooded	RI score
Small/Essex Skipper	-81	-72	7
Large Skipper	-23	-23	7
Brimstone	-18	30	3
Large White	56	-19	2
Small White	-21	-19	2
Green-veined White	-19	-19	4
Orange Tip	-38	-6	4
Common Blue	-100	-99	8
Holly Blue	-56	-50	6
Red Admiral	157	200	1
Small Tortoiseshell	-72	-56	2
Peacock	-6	158	3
Comma	179	160	3
Speckled Wood	-6	54	6
Gatekeeper	-42	-9	6
Meadow Brown	110	87	6
Small Heath	-64	-80	7–8

Table 7. Comparison of flooded and unflooded areas at Priory

In the case of this table, the Large White, Orange Tip, Peacock, Speckled Wood, Gatekeeper and Small Heath show (as individual species) significant differences between the flooded and unflooded areas. Several other species are near the margin of significance.

(iii) Comparing groups of species and different broods

The aim of this set of comparisons was to see if groups of taxonomically, phenologically or ecologically similar species showed similar trends, which would allow comparisons of larger groups across the range of sites. It was also used to see if any multi-brooded species at Priory showed a disproportionate recovery later in the season compared to other sites. There was in fact very little discernible for the former, except that the Nymphalid species appeared to challenge the prediction of the RI score. Attempts to find a similarity between the first brood Green-veined Whites and Orange Tips as a contrast to a strong recovery in the second brood were also largely fruitless, although the second brood did show a remarkable synchrony in abundance across all sites. The relative brood sizes of the Speckled Wood, however, do show a significant effect at Priory with respect to the comparator sites – the abundance peak in week 22 (Butterfly Monitoring Scheme week number) is nine times that for week 4. The other sites are broadly similar to each other with an equivalent ratio of around 3:1. This subject is discussed below, especially with reference to the complex brood structure of the Speckled Wood.

Discussion

(i) The individual species

Small and Essex Skippers *Thymelicus sylvestris* and *T .lineola*

Most of the transect walks make no distinction between these two species, although their development is different in that the Small Skipper overwinters as a larva, and the Essex Skipper in egg form. This might make some difference to their survival chances when inundated, but the data do not allow this to be examined. The species had an RI score of 7 based on "average" characteristics. Both comparing Priory with other sites, and with internal comparisons, these species appear to have suffered significantly from the flooding and were unable to recolonise from adjacent areas within one season. The species were completely eliminated from section D in 1998 where they had previously been quite common.

Large Skipper *Ochlodes venata*

It might have been expected that the Large Skipper would have suffered a similar fate to the above, but the sampling statistics do not allow any such conclusion to be drawn. It was not eliminated from any transect section at Priory in 1998.

Brimstone *Goneopteryx rhamni*

No discernible effect from the flooding (as might have been expected from its low RI score of 3).

Large White *Pieris brassicae*

This species had a very low RI score of 2, due to its being a strong flyer with substantial migratory reinforcement. It shows no change in abundance at Priory compared with the other sites. However, within Priory, it shows the rather counter-intuitive result of being commoner in 1998 in the flooded areas than in the unflooded.

There are two references in the literature, which may shed light on this anomaly. Newman (1959) states that the Large White tends to rest or roost on white flowers, an observation he probably derived from Frohawk, who mentions the White Dead-nettle, *Lamium album*, being used as a roost. Examining the data from the Priory transect, it is clear that the sections and weeks with the greatest number of large Whites coincides with the area times of Bramble *Rubus fruticosus* flowering, which may just account for the observed distribution, as may the fact that *Rubus* leaves are pale beneath and similar in colour to the ventral wing of the Large White.

Small White *P. rapae*

The Small White seems to have been relatively unaffected by the flooding – there is no significant difference between data inside or beyond Priory, except that Priory had the smallest decline of all the sites. Like the above species, the Small White is a strong flyer with migratory reinforcement.

Green-veined White *P. napi*

This species was presumed to be fairly vulnerable to flooding and only moderately likely to recolonise (RI score = 4). It showed the largest fall at Priory compared with all other sites, but there was no significant difference within Priory. There was also no significant difference between the first and second brood sizes at Priory compared with other sites, confirming the relatively low rate of single-season recolonisation.

Orange Tip *Anthocharis cardamines*

Somewhat surprisingly (when compared with the Green-veined White), this species showed the least decline at Priory, although there was a significant difference between the flooded and unflooded areas (also unlike *P. napi).* Why this difference between the two species should exist is unclear, since they share foodplants, biotope and general features of ecology.

Common Blue *Polyomattus icarus*

The Common Blue was very nearly eliminated from Priory – all transect sections were affected – in fact only one Common Blue was seen in 1998. This is the greatest year-on-year fall for this species across all transect sites in the county going back at least ten years. The Common Blue has an RI score of 8 – the highest for all the species considered and due to its rather colonial behaviour and the fact that it pupates over the winter in litter or actually below ground level and is therefore vulnerable even to water-logging. Plate 6.

Holly Blue *Celastrina argiolus*

This species also hibernates as a pupa at or below ground level, but is rather more mobile and is therefore more likely to recolonise. It had marginally the greatest drop in abundance compared with other sites, and there was little difference between flooded and unflooded areas at Priory. However, there are intriguing differences between first and second broods. The second brood abundance was between 50 and 100 percent lower than the first at all sites except Priory, where the second brood was about 15 percent larger. It is also true that in 1998 Holly Blue numbers were declining countywide due to the cyclical depredations of the parasite *Listrodomus nycthemeus* (Revels 1993). It may be that the local population of *L. nycthemeus* was reduced by the loss of infected Holly Blue pupae, allowing inwardly migrating Holly Blues to have greater breeding success in the late summer brood.

Small Tortoiseshell *Aglais urticae*

This species did not show any significant effects of flooding at Priory compared with other sites, but was observed significantly less on the flooded areas within Priory. This will be discussed below.

Red Admiral *Vanessa atalanta*

This species (with an RI score of only 1) was difficult to assess as only Whipsnade (outside Priory) had a large enough count to be significant. Within Priory, it shows the same trend as the Small Tortoiseshell.

Peacock *Inachis io*

The Peacock also shows the same trend as above, although the "preference" for unflooded areas at Priory is much more marked – a 158 percent increase in abundance as against a nearly 7 percent decrease.

Comma *Polygonia c-album*

This species breaks the trend above, but the effect is statistically marginal.

Speckled Wood *Parage aegeria*

The Speckled Wood has a complex overlapping brood structure due to some of the autumn generation overwintering as larvae and others as pupae. The risks from inundation have been assumed to be similar for both stages. The RI score of 6 is questionable, since the species did not do badly at Priory compared to other sites, although the much greater abundance in the unflooded areas at Priory compared to the flooded areas is marked. The autumn brood (mentioned above) is disproportionately and relatively larger than at other sites, indicating a substantial inward migration or a very high survival rate of the post-flooding generations. The "final" brood of 1998 is, however, no later at Priory than anywhere else in the study.

Gatekeeper *Pyronia tithonus*

Compared to the other sites, the fall in Gatekeeper numbers was not dramatic. Within Priory, the distinction between flooded and unflooded areas is much more obvious, with a decline five times greater in the flooded sections. It was suspected that, if the numbers recorded included insects moving in, the abundance peak might have been delayed with respect to other sites, but there is no evidence for this.

Meadow Brown *Maniola jurtina*

This species confounds the RI score completely. It showed the largest percentage increase over all sites at Priory and increased its abundance more on the flooded sections. Whether this can be explained by the ease with which it can expand its local range over rough grassland is unclear. There is no evidence for a delayed abundance peak.

Small Heath *Coenympha pamphilus*

The Small Heath seems to have been seriously affected over the whole of Priory, possibly due to vulnerability to waterlogged soil. It showed the greatest fall at Priory compared to all other sites.

(ii) Species groups

The statistical error can be reduced if species are grouped into larger units, provided there is some *a priori* reason for doing so.

The Skippers

The statistics do not allow plausible conclusions to be drawn for the Large Skipper, but grouping all Skipper species together does show a significant detrimental effect from flooding both inside and beyond Priory. The M score component prediction is probably quite soundly based as other data from Hill Rise (Anderson 1997, unpublished data) does show a substantial lack of mobility of Skipper species, where the "good areas" can be predicted within a few metres year after year.

The Whites

Although there are taxonomic links between these species, their phenology and life histories are different. The expected similarities between the Orange Tip and first brood Green-veined Whites did not materialise. There was also little correlation of abundance changes within the group of remaining White species.

The "Vanessids"

Grouping these four species together (the Small Tortoiseshell, Comma, Red Admiral and Peacock) shows a clear bias towards the unflooded areas at Priory having a smaller decrease or larger increase than the flooded areas. This bias would be larger but for the countervailing trend of the Comma. The RI score does not predict this. Since all the species attempt to hibernate (the Red Admiral usually unsuccessfully), it may be that the flora of late summer provide an explanation. It was observed that detritus suppressed some of the flora in the flooded areas and there was also an (apparently unconnected) abundance of Bristly Ox-tongue *Picris echoides* in the unflooded areas (Newman 1998 pers. comm.). This would have provided a nectar source until well into the autumn and may have led to preferential feeding in the unflooded areas.

The "Satyrs"

This sub-family showed no common trend, except insofar as the Meadow Brown and Gatekeeper defied the RI scores prediction in the comparator site section of the study (the Meadow Brown likewise within Priory) and no species showed the effect of abundance peak delay.

All species with an RI score of 6 or above

Comparing Priory with other sites, it is clear that Priory had five out of eight greatest falls in abundance between 1997 and 1998. Within Priory, the flooded areas had five out of eight greatest falls compared with the unflooded areas (although interestingly not quite the same five).

(iii) The effects of flooding

It is easy to assume that the effects of flooding are the same as the effects of immersion. This is not necessarily the case. Immersion implies static water, the only effect of which on the organism is drowning or chilling. Flooding implies a dynamic effect from the water. Depending on the severity, there are other effects, such as the physical washing away of the organism or foodplant, the burying by silt or other detritus of the organism or its food plants and the effect on the populations of predators and parasites. Conversely, the deposition of silt may alter the nutrient balance of the soil locally, causing other changes in the abundance and distribution of the flora.

A study of the flora around the transect was undertaken in 1993 (Bates, unpublished data). The spatial sampling was fairly coarse, so although there does not seem to have been any significant change in the distribution of possible nectar sources (e.g. Thistles *Cirsium)*, it is not possible to say whether finer grained changes have occurred or whether the flooding added nutrients and therefore changed the amount of nectar being produced. Most of the larval foodplants of the Common Blue appear to grow in section B, which was largely unflooded, so it is presumed that suppression of leguminous plants is not the reason for the collapse of the Common Blue population. The study did not differentiate between grass species, so it is not possible to comment on the effect on the Browns and Skippers. Cruciferous plants were not recorded, so no conclusions can be drawn about the effect on the larval foodplants of the Whites.

(iv) Evidence from Parkwood Local Nature Reserve

Due to a change in transect route between 1997 and 1998, no numerical data can be used from this site. However, the data do tend qualitatively to reinforce the conclusions drawn from the other sites.

Conclusions

It seems reasonable to assume that the relatively large declines of several species can be attributed to the effects of the flooding. The RI scoring system worked quite well on five or six of the eight species with a high score. Counter-intuitive results were found for the Large White, the Vanessids and some of the Satyrs. The most obvious example of the harmful effect of the flood was the dramatic fall in the numbers of the Common Blue. It will be interesting to see if numbers recover during the 1999 season.

ACKNOWLEDGEMENTS

We are grateful to all those recorders whose efforts over two seasons provided the data for this study. We are also especially grateful to Charles Baker, Errol Newman and Ian Woiwod for advice, information and assistance provided before and during the study.

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Brian Anderson has had a life-long interest in butterflies. He was involved in the early stages of establishing the Local Nature Reserve at Hill Rise, Bedford where he currently records butterflies on a transect route. Roy Bates is warden at Priory Country Park where as part of his duties he carries out a butterfly transect walk to monitor populations of butterflies within the park.

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MACRO-MOTHS
by Len Field

The content of this report is somewhat less than the level of activity that certainly took place in 1998. The requirement to produce the report one month earlier means that there are fewer records than normal. Only the Rothamsted (RIS) traps from Cockayne Hatley and Eaton Bray (1997) are included. Notwithstanding this the whole of 1998 was another poor year. Generally the number of species recorded was well down on 1997 and 1996 although there have been some notable inclusions.

Throughout the year there were very few favourable nights for moth recording and the number of records have suffered accordingly. Most months were either wet or cold or a combination of the two. Due to the unpredictability of the weather no fewer than forty species have been recorded outside of their previously known flying season.

Despite the weather we did manage to run two reasonably successful moth evenings. The first was the annual society meeting this year held at Waterloo Thorns, Tempsford. Although not a promising evening twelve hardy souls braved the elements to try their luck.

The second evening was run at the John Dony Field Centre, Luton. Again the weather was dismal and wet but over seventy people, many of them children, took part in the event. My thanks to Vic Arnold who provided the necessary equipment to run the traps on both evenings.

All numbers and English names are taken as per *A Recorder's Log Book or Label List of British Butterflies and Moths* by J.D.Bradley and D.S.Fletcher (Curwen, London 1979).

INDIVIDUAL SPECIES RECORDS FOR 1998

There were six notable records for 1998 which are:

1633 **Small Eggar**
Recorded by A.J.G.David at Reynes Drive, Oakley on 28th March TL05(B). This is the first time that the adult moth has been recorded in the county. All previous records have come from larval sightings.

1760 **Red-Green Carpet**
Recorded by Br John Mayhead at Turvey Abbey on 29th March. This is only the second record of this moth in the county and a new 10km square record (SP95L).

1760 **Red-Green Carpet**
Recorded by C.Aylott at Woodford Road, Dunstable on 14th December TL02(G). This is the third record of this moth in the county. It was a female taken at light well out of season. It was taken on a very warm night when the temperature was recorded as 14°C.

1718 **The Oblique Striped**
Recorded from RIS Trap at Cockayne Hatley (TL24) on 7th August. Initially recorded from Potton in 1997 by J.Childs this is confirmation that this species can now be found in the county.

1841 **Yarrow Pug**
Recorded at Everton (TL14) and at Sandy Heath (TL15) by J.Reid. Both Yarrow Pug records are new records for the county and were identified from larva found feeding on dried seed-heads of Yarrow during September.

In addition there is an unconfirmed record of the White Marked (2140). This was taken by Br John Mayhead at Turvey Abbey (SP95L) on 19th April.

Other records of interest:

378 **Orange-tailed Clearwing**
Recorded by R.Wilson at Sherborne Avenue, Luton (TL02X) on 26th July. This is the first time this moth has been recorded in the county since 1984.

380 **Six-belted Clearwing**
Recorded by T.Thomas at Warden Hill, Luton (TL02X) on 8th July.

1637 **Oak Eggar**
Recorded by A.Hurst in her garden at Norton Road, Stotfold (TL23) on 30th July. Also recorded from Regent Street, Stotfold by B & E Bowskill on 24th July. This species was last recorded from this 10km square in the 1950s.

1692 **Lesser Cream Wave**
Recorded for the first time since 1990 on the Society moth evening at Waterloo Thorns (TL15V) on 26th June.

1699 **Least Carpet**
Recorded at Eaton Bray (SP92) on 20th July 1997 from the RIS trap.

1735 **Ruddy Carpet**
Recorded on Pegsdon Hills (TL12) on 9th July by V.Judd. Also recorded from the RIS trap at Cockayne Hatley (TL24) on 6th July. Both are new 10 km square records.

1739 **Wood Carpet**
Recorded at Whipsnade Downs (SP91) on 14th August and Pegsdon Hills (TL12) on 6th August by V.Judd. These are the first records of this moth since 1976.

1964 **The Annulet**
Recorded at Whipsnade Downs (SP91) on 14th August and Pegsdon Hills (TL12) during August by V.Judd.

1984 **Humming Bird Hawk Moth**
A welcome reappearance in 1998 after a blank 1997.

2369 **Bulrush Wainscot**
Recorded at Rifle-range Farm, Yelden (TL06) by T.Smith on 29th August.

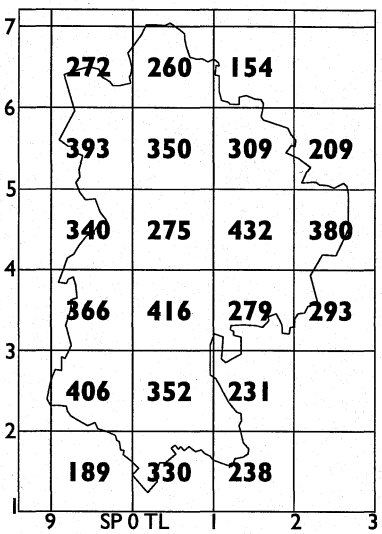
2385 **Small Mottled Willow**
Recorded from the RIS trap at Cockayne Hatley (TL24) on 18th September. This is only the second record of this migrant moth in the county.

For those people who would like to update their copy of *The Butterflies and Moths of Bedfordshire* I have listed below the 27 new 10km square records for 1998. They are as follows:

TL01 1754
TL02 1749, 1760
TL06 15, 1838, 2369
TL12 16,1735, 1739, 1964, 2384

TL14	1841
TL15	1841, 2014
TL23	1637
TL24	1718, 1735
SP91	1739, 2384
SP92	1681, 1699, 1755, 2331 (all Rothamsted records from 1997)
SP95	1760, 1827, 1944, 2397

The revised map by 10Km square with number of species is shown opposite.



Number of species recorded in each 10km square – as at 31st December 1998

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My thanks go to the following people who have kept records during 1998 and enabled me to produce this report for the year.

J.Adams, P.Almond,V.Arnold, C.Aylott, C.Baker, J.Barnwell, B. & E.Bowskill, C.Carpenter, J.Childs, S.David, N.Dawson, A.Hurst, V.Judd, D.Manning, Brother J.Mayhead, J.Reid, R.C.Revels, H.A.Smith, B.Squires, H.Winter, M.Williams, R.Wilson, I.Woiwod and N.Wood.

Len Field is the Society's Recorder for Macro-Moths, a position which he has held in an honorary capacity since 1997.

MICRO-MOTHS
by David Manning

A poor season inhibits the activities of entomologists as well as the insects that they pursue. This difference in effort applied to the task makes it difficult to comment on the effect that the weather has on moth numbers during the year. The RIS traps are an exception to this problem, as they operate throughout the year, giving a "constant effort" record of moth numbers in each year.

For the last four years I have counted all the micro-moths caught in Ian Woiwod's RIS trap at Cockayne Hatley. 1995 to 1997 produced similar totals, enhanced in 1996 by a large number of the immigrant species *Plutella xylostella* (Linn.). In contrast, in the year 1998 only 40% of this number of moths appeared. The total number of species in each of these years was: 1995, 226; 1996, 246; 1997, 239; 1998, 189.

This total count has not been continued for a long enough period for the figures to be statistically significant, but they appear to show that 1998 was a very poor year.

Nine species have been added to the county list, including two recently recognised from earlier years. These are shown in the same format as entries in the Society's book *The Butterflies and Moths of Bedfordshire.*

Bacota sepium (Speyer) (183)
Larval case on trunk of oak tree at Sharnbrook, 24 April 1998.
Larval food: Lichens †
Map SP 95

Phyllonorycter platani (Staudinger) (321a)
Several mines in fallen leaves at The Embankment, Bedford in November 1998.
Flight: not confirmed in Britain.
Larval foodplant: London Plane †
Map TL 04

Argyresthia glaucinella Zeller (416)
Signs of larval feeding at Studham, Sharnbrook, Great Hayes Wood, late April, 1998 and other sites since then.
Flight: July, August.
Larval foodplant: Oaks †, in the bark.
Map SP 92,93,95,96 TL 01

Pseudatemelia josephinae (Toll) (660)
One found indoors at Studham by C.R.Baker on 24 July 1998
Flight: June to August (week 30)★
Larval food: Probably leaf-litter and lichens.
Map TL 01

Paltodora cytisella (Curtis) (728)
Cooper's Hill, Ampthill. One moth, caught 26 July 1992, identified in 1998.
Flight: July (week 30)★
Larval foodplant: Bracken.
Map TL 03

Apodia bifractella (Duponchel) (730)
Two moths in the RIS trap at Cockayne Hatley, week 13-19 August 1997.
Flight: July, August (week 32)★
Larval foodplants: Common fleabane, *Inula* spp. and sea-aster.
Map TL 24

Oegoconia quadripuncta (Haworth) (870)
One to MV light at Luton, 8-9 August 1998 (R.Wilson)
Flight: July, August (week 32)★
Larval food: Decaying vegetable matter.
Map TL 02

Blastodacna atra (Haworth) (906)
One moth in the RIS trap at Cockayne Hatley in August 1998.
Flight: July, August (week 32)★
Larval foodplant: Apple, in a shoot.
Map TL 24

Endothenia ustulana (Haworth) (1101)
One to MV light at Sharnbrook, 11 July 1998
Flight: June, July (week 28)★
Larval foodplant: Bugle.
Map SP 95

★ Flight times recorded in Bedfordshire. Standard week numbers are described in Arnold *et al* (1997) and are those used by the Rothamsted Insect Survey (RIS).

† Larval foodplants. Observations pertaining to Bedfordshire are marked with an obelus (†) and refer to finding eggs or larvae on the plant.

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David Manning is the Society's Recorder for Micro-Moths, a position he has held in an honorary capacity since 1986. He is co-author of the recent BNHS publication, "The Butterflies and Moths of Bedfordshire".

THE LICHENS OF CHICKSANDS

by Frances Davies

Introduction

Chicksands appears in historical documents as far back as 1086. Two manor houses are listed on the property, one of them being the Priory built by the canons and nuns of the Gilbertine Order of the Catholic Church. At the dissolution of the monasteries in 1538, Henry VIII gave the Priory to Richard Snowe. At a later date the property passed to the Osborne family who held it until 1936 when it was handed to the crown.

In 1936 the Air Ministry set up a Royal Airforce signal operations in the Priory and after the war the grounds were used as a training area for the RAF until 1953 when the US Air Force became involved and developed jointly with the UK Government the Electronic Security Command. Finally in 1995 the property reverted back to the UK Ministry of Defence who are keen to maintain and enhance the conservation value of the site.

There are a number of sites at Chicksands suitable for lichen growth and these range from the fabric of the buildings, walls and memorials, the trees found along the River Flit and the channel which runs through this land and the trees in the old orchard garden and surrounding woodland. Altogether a total of 82 lichen species were recorded as well as 3 species of lichenized fungi.

Habitat Descriptions and Species Lists

Habitat 1 – The Priory and the walled garden

The Priory itself is poorly colonised by lichens; this may be due to renovations and disturbances which have taken place to the building over the years and also extensive shading in some areas by shrubs and trees. Of interest was *Bacidia saxenii* found growing on an old piece of ironwork and *Verrucaria dolosa* growing on flints inserted in the stonework.

Behind the Priory is an extensive grassed area surrounded by old brick walls and with small brick built outhouses roofed with old terracotta tiles. On these tiles were found good growths of *Xanthoria parietina* and *Lecanora muralis*, lichens common on nutrient enriched substrates and this may be due to nitrogen enrichment enhanced by bird droppings or localised use of fertilisers in the garden. Lichens were also found growing on mortar, cement and in the case of *Caloplaca citrina*, growing over mosses.

Aspicilia calcarea
Aspicilia contorta
Bacidia caligans
Bacidia saxenni
Caloplaca aurantia
Caloplaca citrina
Caloplaca flavescens
Caloplaca holocarpa
Caloplaca saxicola
Caloplaca teicholyta
Candelariella aurella
Candelariella vitellina
Cladonia fimbriata
Cladonia macilenta
Cladonia pyxidata
Clauzadea monticola
Diploica canescens
Diploschistes scruposus

Haematomma ochroleucum var. porphyrium
Hypogymnia physodes
Hypogymnia tubulosa
Lecania erysibe
Lecania erysibe f. sorediata
Lecanora albescens
Lecanora campestris
Lecanora conferta
Lecanora conizaeoides
Lecanora dispersa
Lecanora muralis
Lecanora polytropa
Lecidea fuscoatra
Lecidella elaeochroma
Lecidella scabra
Lecidella stigmatea
Lepraria incana
Parmelia sulcata
Phaeophyscia orbicularis
Physcia adscendens
Porpidia tuberculosa
Psilolechia lucida
Rinodina teichophila
Rinodina gennarii
Stereocaulon nanodes
Tephromela atra
Trapelia coarctata
Trapelia involuta
Trapeliopsis granulosa
Verrucaria dolosa
Verrucaria muralis
Verrucaria nigrescens
Verrucaria viridula
Xanthoria calcicola
Xanthoria parietina

Habitat 2 – The fruit trees in the walled garden

Inside the walled garden are a number of old fruit trees, the remains of an orchard once growing in the garden. Growing on the bark of these trees were a number of corticolous lichen species and the presence of *Xanthoria candelaria, X. polycarpa* and *Phaeophyscia orbicularis* suggest the tree trunks have been impregnated with nutrient-enriched dust.

Amandinea punctata
Anisomeridium nyssaegenum
Candelariella vitellina
Lecanora conizaeoides
Lecanora expallens
Lecanora saligna
Lepraria incana
Parmelia subaurifera
Parmelia subrudecta
Phaeophyscia orbicularis
Physcia adscendens
Physcia tenella
Physconia grisea
Xanthoria candelaria
Xanthoria polycarpa

Habitat 3 – The retaining walls of the ha-ha

In front of the Priory are the old (1908) siliceous walls which support a ha-ha. These walls are covered with the crustose thalli of *Acarospora fuscata, Porpidia tuberculosa* and *Trapelia placodiodes*. Amongst the growth of moss on these walls can be found the *Cladonia* spp.

Acarospora fuscata
Cladonia chlorophaea
Cladonia coniocraea
Cladonia macilenta
Cladonia pyxidata
Diploschistes muscorum
Physcia caesia
Placynthiella icmalea
Porpidia tuberculosa
Trapelia placodiodes

Habitat 4 – The war memorial

Standing in front of the Priory is a war memorial, which has been in its present position since the 1970s.The angled base shows good lichen cover whilst the vertical sides of the cross are covered with the thick chalk-like thallus of *Dirina massiliensis* with soralia, which are granular reproductive structures.

Caloplaca flavescens
Candelariella aurella
Candelariella medians
Candelariella vitellina
Dirina massiliensis f. sorediata
Lecania erysibe
Lecanora albescens
Lecanora crenulata
Lecanora dispersa
Phaeophyscia orbicularis
Verrucaria baldensis
Verrucaria viridula

Habitat 5 – The trees along the water channel.

The River Flit, at an early date was diverted to produce a feature close to the Priory. This was achieved by constructing a weir and sluice gates and producing an attractive waterfall near the Priory and a broad channel whose banks are lined with Weeping Willows, Ash and Alders. The bark of the Ash and Willow trees have a higher pH than most trees, as well as a higher moisture retaining capacity.This along with the shade produced by these trees allows conspicuous branching tufts of *Ramalina farinacea* as well as good growths of *Physcia adscendens* and *Phaeophyscia orbicularis*.The more acidic bark of the Alder trees favours growth of *Parmelia sulcata* and *Dimerella pineti.*

Amandinea punctata
Bacidia arnoldiana
Candelariella vitellina
Dimerella pineti
Parmelia sulcata
Phaeophyscia orbicularis
Physcia adscendens
Ramalina farinacea
Xanthoria polycarpa

Habitat 6 – Chicksands Wood and isolated trees in the grounds

In the woodlands the shaded, humid conditions favour the growth of lichens such as *Anisomeridium nyssaegenum* and *Arthronia spadicea* whilst at the edge of the woodland and along the paths and rides the drier, sunlit conditions allow *Cliostomum griffithii* and *Lecidella elaeochroma* to thrive. Scattered around the grounds are mature isolated Oak and Elm trees, which also carry very distinctive lichen assemblages.Three lichenicolous lichens were found growing on the smooth thin twigs of trees. These are lichens which have an independent lichenized thallus and grow obligately on other lichens.

Amandinea punctata
Anisomeridium nyssaegenum
Arthonia spadicea
Bacidia arnoldiana
Cladonia fimbriata
Cliostomum griffithii
Dimerella pineti
Lecanora chlarotera
Lecanora conizaeoides
Lecanora expallens
Lecidella elaeochroma
Lepraria incana
Opegrapha niveoatra
Opegrapha vulgata
Parmelia sulcata
Phaeophyscia orbicularis

Physcia adscendens
Physcia tenella
Trapeliopsis granulosa
Xanthoria parietina

Athelia arachnoidea
Mycoporum hippocastani
Mycoporum quercus
} lichenicolous lichens

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Frances Davies is the Society's Recorder for Lichens, a position which she has held in an honorary capacity since 1975. Frances is Senior Lecturer in Plant Ecology at the University of Luton.

FLOWERING PLANTS, FERNS AND FERN ALLIES (Spermatophyta and Pteridophyta)

by Chris Boon

1998 was the penultimate year recording for the BSBI Atlas2000 project. It is anticipated that the new atlas of the British flora will be published early in 2001. It will not only contain the distribution maps but information on the ecology, rarity and changes in distribution over the last 30 years or so. The dots representing the Bedfordshire 10km squares will indicate the hard work of the Flora Group during these last years. In fact, during 1998 about 18,500 records of about 850 species were made. All these records have been entered on the database at the Bedfordshire and Luton Biological Records Centre which is based at Bedford Museum. This makes the total number of botanical records, from 1987 onwards, on the database about 140,000.

Much of the recording in 1998 was aimed at ensuring that records of the commoner species were made in each 10km square, but, inevitably, several interesting plants were seen. *Cruciata laevipes*, Crosswort, an attractive, but locally rare member, of the Bedstraw family, was found by Phil Irving in Biscot Churchyard (TL02R). Phil also discovered a relatively insignificant chickweed look-a-like, *Minuartia hybrida*, Fine leaved Sandwort, on heathy ground near Sandy (TL14Z, TL24E). Fine leaved Sandwort has not been seen in the county for 10 years or more.

An unusual looking and uncommon species is *Cuscuta europaea*, Greater Dodder, which is normally parasitic on nettle. It is a nationally scarce species and, in Bedfordshire, is found along the banks of the River Ouse. However Steve Halton and Chris Boon discovered some south of Blunham on the bank of the R. Ivel (TL15K). Plate 9. It has not been recorded for certain on the R. Ivel before, but the site was some 3km from the confluence with the R. Ouse. With the opening of the Kingfisher Way along the R. Ivel it will be a plant worth looking out for in order to determine how far south it might occur along the river.

Orchids are a group that interest many people and 1998 was quite a good year for many orchid species. It is good to report that the rare orchids of Totternhoe Knolls (SP92R) were well in evidence. Plates 7, 8. These are *Aceras anthropophorum*, Man Orchid, *Coeloglossum viride*, Frog Orchid and *Herminium monorchis*, Musk Orchid. This reserve has improved considerably over recent years due to conservation work and the presence of goats. It is to be hoped that the improvement continues. A very elusive orchid is *Neottia nidus-avis*, Bird's-nest Orchid, and it is good to report that Pete Smith recorded it near Aspley Guise (SP93H) at a site where it has been known on and off for many years. However, there have been virtually no records in recent years for *Platanthera chlorantha*, Greater Butterfly Orchid, which formerly could be found regularly in many woods. Often leaves can be found, which may be this orchid, with the flower stalk bitten off. Another species is the nationally scarce *Epipactis phyllanthes*, Green-flowered Helleborine, which grows near Barton (TL02U). In 1998 only one plant was present which, a few days later, had been eaten. It would be interesting to determine the culprits, presumably Rabbits or Muntjac.

In 1997 the first record for Bedfordshire of *Spergularia marina*, Lesser Sea-spurrey, a salt-marsh invader of roadsides, was reported on the A5. However, that site is in the

vice-county of Hertfordshire (v.c. 20). In 1998 it was found again, on a roadside near Luton (TL01Z), by Pat Baker and, for afficianados of vice-counties, this record is, in fact, the first record for the vice-county, v.c.30.

ACKNOWLEDGEMENTS

I would like to thank all those who have sent in records and especially those who are taking part in the Flora Project.

V. Arnold, C. Baker, P. Baker, G. Bellamy, C. Boon, R. Brind, C. Carpenter, K. Cavanagh, P. Cavanagh, J. Comont, P. Cook, M. Day, D. George, D. Gowing, S. Halton, S. Hawkins, A. Hurst, P. Irving, T. James, V. Johnston, R. Maycock, M. Powell, R. Revels, P. Smith, J. Wakeley, A. Woods, R. Woolnough.

Chris Boon is the Society's Recorder of Flowering Plants, Ferns and Fern Allies, a position which he has held in an honorary capacity since 1986. He has also been Recorder for Bedfordshire for the Botanical Society of the British Isles (BSBI) since 1982.

BEDFORDSHIRE NATURAL HISTORY SOCIETY 1999
(Established 1946)

Honorary Chairman:
Mr A. Cutts, 38 Mountfield Road, Luton LU2 7JN

Honorary Secretary (Acting):
Mr K. Sharpe, 22 Russett Close, Stewartby MK43 9LG

Honorary Treasurer:
Mr C. Rexworthy, 66 Jeans Way, Dunstable LU5 4PW

Honorary Assistant Treasurer:
Mrs S. Brooke, 18 Park Hill, Toddington LU5 6AW

Honorary Editor (Bedfordshire Naturalist):
Miss R.A. Brind, 46 Mallard Hill, Bedford MK41 7QS

Honorary Membership Secretary:
Mrs M.J. Sheridan, 28 Chestnut Hill, Linslade, Leighton Buzzard, Beds LU7 7TR

Honorary Scientific Committee Secretary:
Mr P. Cannings, 30 Graham Gardens, Luton LU3 1NQ

Honorary Chairman of Bird Club:
Mr P. Smith, The Old Rectory, Hills End, Eversholt, Milton Keynes MK17 9DR

Council (in addition to the above):

Mr J. Adams, Mrs G. Dickens, Mr P. Glenister, Mr D. Green, Mr S. Halton, Mrs S. Larkin, Mr K. Sharpe, Mr P. Soper, Mr M. Williams, Mr R. Woolnough.

Honorary Editor (Muntjac):
Mrs S. Larkin, 2 Brown's Close, Marston Moreteyne, Bedford MK43 0PL

Honorary Librarian:
Mrs G. Dickins, 9 Ullswater Road, Dunstable LU6 3PX

Committees appointed by Council:

Finance: Mr A. Cutts, Mrs S. Brooke, Mr P. Cannings, Mr C. Rexworthy, Mr K. Sharpe, Mrs M. Sheridan, Mr P.Smith.

Scientific: Mr C. Baker, Mr C. Boon, Miss R. Brind, Mr P. Cannings, Mr J. Comont, Mr A. Fleckney, Mr S. Halton, Mr P. Irving, Mrs H. Muir-Howie, Dr B. Nau, Mr E. Newman, Mr J. Palmer, Mr R. Revels, Mr H. Winter.

Programme: P. Glenister, S. Halton, R. Woolnough.

Registered Charity No. 268659

REPORT OF COUNCIL FOR 1998

The Society continued to maintain a high standard of meetings. During the year there were 33 field meetings and 18 indoor meetings.

Thirteen of the outdoor meetings were specifically bird-related and organised by the Bird Club, the remainder being on very varied topics ranging from veteran trees to chalk grassland management. A weekend field meeting was held in the Yorkshire Dales National Park during June. An "Otter and Water Vole Day" and a "Badger Training Day" were held in conjunction with the Wildlife Trust for Bedfordshire and, similarly, a "Bat Evening" with the Bedfordshire Bat Group. The Society continued its long-term monitoring and management of the Midwife Toad population in and around Bedford.

Seven of the indoor meetings were in association with the Bird Club. These were very well attended with more modest numbers at other meetings.

Sales of the latest Society book, *The Butterflies and Moths of Bedfordshire*, have gone very well. Council hopes that the new book, *Wild Bedfordshire*, which will cover some eighty of the more important wildlife sites in the county, will be ready for publication in mid-1999.

Still behind the scenes, work continued on *The Red Data Book for Bedfordshire*, a joint venture with other natural history groups. Thanks to the dedicated work of our Recorders and other members the first issue has been completed; a concise version should be available to the public later in 1999. The Bird Club concluded its study of the Lady Amherst's Pheasant and hopes to publish its findings in the next Journal.

The finance committee indicated that it would be prudent to retain a general operating reserve of cash and en-cashable bonds to enable the Society to function properly in adverse financial conditions. Council endorsed this action and set aside £30,000 for this purpose. Because of the programme of intended publications over the next ten years, the Society will continue to run an annual deficit, even if subscription rates rise. It is Council's decision to put our large collection of records and our members' expertise to good use for the benefit of future generations of naturalists and historians that has prompted this action.

Council would like to thank the many people who have contributed to the work of the Society during the year, in particular the programme committees and the Recorders. During 1998 we welcomed several new Recorders on board, increasing the range of groups studied.

Five members of Council stepped down during the year; Peter Clark, John Comont, Paul Dove, Paul Madgett and Peter Wilkinson. Council would like to express its thanks to them for their past contributions to the Society's work. Stephen Halton, Sue Larkin and Chris Rexworthy joined Council at the last AGM. Once again, Council would like to express its appreciation to the management committee and members of the Bird Club for continuing to make it such a success.

As recommended by members at the AGM, Council has brought in a new "full-time student" concession that has been advertised at the halls of residence within the county.

Membership of the Society 1991-1998

	1991	*1992	1993	1994	1995	1996	1997	1998
Ordinary	348	435	450	430	414	395	394	372
Associate	46	62	68	41	48	66	57	54
Student	3	4	5	3	2	6	5	5
Corporate	10	12	13	10	7	9	11	11
Life	5	5	5	5	4	4	3	3
Hon. Life	2	1	1	1	1	1	3	3
Totals	414	511	542	490	485	481	473	448

(*formation of Bird Club)

Fifty-seven ordinary members currently take advantage of the "senior citizen" concession. The Bird Club had a total membership of 253 at the end of the year, of which 72 persons are "Bird Club only" members. Subscriptions currently generate a little over £4,500 of our total income per year. Council is looking into ways that membership might be increased.

PROCEEDINGS

Indoor Meetings

8th January, Elstow. Members' evening focusing on activities of the Society. Chair: Peter Wilkinson.

21st January, Toddington. "Onchids and Orchids" by Trevor Tween. Chair: Pat Baker.

27th January, Maulden. "Crossbills" by Alan Knox. Chair: Barry Nightingale.

12th February, Elstow. "Current affairs in Bedfordshire". Stephen Halton (Assistant Project Officer, Greensand Project and Gavin Kennerly (Conservation Officer, Wildlife Trust) talk about aspects of the County Biodiversity Action Plan. Chair: Rosemary Brind.

18th February, Toddington. "Chalk grassland management in Bedfordshire" a series of short contributions by Andy Fleckney (Wildlife Trust), Pauline Oliver (Bedfordshire County Council), Jeremy Sutton (National Trust), Graham Bellamy (English Nature). Chair: Richard Woolnough.

12th March, Elstow. "Veteran Trees – a national treasure at risk" by Ted Green (English Nature; member of the Ancient Tree Forum). Chair: John Niles.

24th March, Maulden. Annual General Meeting.

31st March, Maulden. "Birding in Churchill, Manitoba" by Barry Trevis. Chair: Barry Nightingale.

25th April, Bedford. "Otters and Water Voles". A practical course at Priory Park, Bedford by the Wildlife Trust.

29th September, Maulden. "Birding in Washington State" by Dave Kramer. Chair: Barry Nightingale.

8th October, Elstow. "The Marston Vale Community Forest" by the staff of the Forest project. Chair: Stephen Halton.

14th October, Toddington. "Butterfly Introductions" The pros and cons by Greg Herbert (Butterfly Conservation) and Wildlife Trust Reserves by Andy Fleckney (Wildlife Trust for Bedfordshire). Chair: John Comont.

27th October, Maulden. "A strange name for a bird" by Paul Fuller. Chair: Barry Nightingale.

12th November, Elstow. "Bedfordshire Fossils" by Chris Andrew (Bedford Museum). Chair: Rosemary Brind.

18th November, Haynes. "Bats – results of the Ice House survey" by Bob Cornes. Chair: Tony Aldhous.

24th November, Maulden. "A study of Buzzards" by Robin Prytherch. Chair: Barry Nightingale.

10th December, Haynes. Christmas social evening and quiz. Organisers: John Adams and Dave Parsons.

Field Meetings

Bramingham Wood, Luton 31st January. Looking at coppice cycle management with Bramingham Wood Volunteers. Leaders: Rod Higginson and John Trew.

Ouse Washes 1st February. Looking at birds starting from Welney WWT Reserve. Leader: Pete Marshall.

Haynes 21st February. Badger Training Day, in association with Bedfordshire Badger Network and the Wildlife Trust. Organiser: John Adams.
Moat House pond, Bedford 8th March. Working party to clear rubbish and excess plant growth from this important amphibian site. Organiser: David Anderson.
Windsor Great Park 21st March. Looking at ancient and veteran trees. Leader: Ted Green (English Nature; member of the Ancient Tree Forum).
Blows Downs 19th April. Looking for spring migrants, starting at Skimpot Lane, Luton. Leader: Rob Dazley.
Thornborough Church, Bucks 26th April. Learning about Lichens. Leader: Tom Chester.
Maulden Woods 3rd May. Dawn Chorus. Leader: Paul Trodd.
Arlesey 10th May. Water Vole survey starting from Arlesey. Leader: Gavin Kennerley.
Dunstable Sewage Treatment Works 13th May. Waders and other migrants. Leader: Paul Trodd.
Bramingham Wood, Luton 16th May. A follow-up meeting on coppice management. Leaders: Rod Higginson and John Trew.
Little Paxton, Cambs 3rd June.Looking for Nightingales. Leader: Warden, Paxton Pits.
Woburn Park 6th June. A guided tour of the deer herds. Leader: Callum Thomas (Woburn Deer-keeper).
Yorkshire Dales weekend field trip 19th–21st June. Organiser: Stephen Halton.
Wavendon Heath 24th June. Looking for speciality birds of the Greensand Ridge. Leader: Peter Smith.
Waterloo Thorns, Tempsford 26th June. Mothing evening. Leader: Len Field.
Lea Valley & Epping Forest 28th June. Looking at dragonflies at the Lea Valley Dragonfly Reserve and at Wake Valley Pond, Epping Forest. Leader: Allan Cutts.
Bromham Lake LNR 5th July. General natural history. Leader: Peter Almond.
Maulden Woods 12th July. Bird-ringing demonstration. Leader: Phil Cannings.
Rammamere Heath 14th July. Looking at latest developments. Leaders: Stephen Halton and Phil Irving.
Maulden Woods 19th July. Grassland Heath Management techniques. Leaders: Stephen Halton and Phil Irving.
Chicksands Wood 19th July. Looking at woodland butterflies. Leaders: John Adams and Dave Parsons.
Stour Estuary NR, Essex 16th August. Looking at effects of differing management regimes on flora and fauna. Leader: Russell Leavett (RSPB).
Bedfordshire 29th August. Demonstrating the 'time expansion bat detector'; ten year celebration meeting of the Bedfordshire Bat Group. Leader: Joan Childs.
Dungeness 20th September. Looking for autumn migrants. Leader: Mike Williams.
Salcey Forest, Northants 27th September. Looking at the woodland management. Leaders: Peter Brett and Wildlife Ranger (Forest Enterprise).
West Wood, Souldrop 18th October. Fungus Foray. Leader: Alan Outen.
Ashridge, Herts 25th October. Deer rut. Leader: David Anderson.
Ouse Washes 22nd November. Winter wildfowl. Leader: Don Green.
Woburn Park 26th December. A Boxing Day walk through the Park. Leader: Mary Sheridan.

BEDFORDSHIRE NATURAL HISTORY SOCIETY

Registered Charity No. 268659

INCOME AND EXPENDITURE ACCOUNT FOR YEAR ENDED 31st DECEMBER 1998

	1997	1998
OPENING BALANCE (Current and Deposit A/cs)	26,672	20,760
INCOME		
Subscriptions, Grants and General Purpose Donations	10,117	4,033
Investment	1,029 [1]	1,115
Sales	7,289	1,694 [2]
Project	-	189 [3]
Sub Total Income	**18,435**	**7,031**
EXPENDITURE		
General Administration	6,658	1,084 [4]
Speakers and Hire of Halls	1,163	907
Periodicals		
Hobby, Muntjac and Bedfordshire		
Naturalist Parts 1 and 2	16,527 [5]	7,023
Project	-	738 [6]
Sub Total Expenditure	**24,348**	**9,752**
CLOSING BALANCE (Current and Deposit A/c)	**20,759**	**18,039**

ASSETS AS AT 31.12.98

Midland Bank Current Account	5,062	220
Woolwich Deposit Account	15,697	17,819
City of Nottingham Bonds	6,000	6,000
M & G Charifund Accumulation		
475 units - cost £10,000.00	24,937	27,198
Stock at costs	4,998	- [7]
Fixed assets	1,826	- [8]
	58,520	**51,237**

Notes

1. Consists of Interest from Bank, Building Society and Bonds.
2. This year's figures represent sales alone.
3. Project income consisted of an M & S Donation of £189.00 earmarked for East Hyde.
4. Insurance premium of £286 unpaid at 31.12.98.
5. Last year's figure includes Book Publication costs, Hobby and Muntjac paid up to date. Journal paid up to 1996 part 1 and 1997 part 2.
6. Project Expenditure comprised:

a) Grants.	Ivel Ringing Group	514	
	Ms R Langford: research	87	
b) Bird Club expenditure of earmarked funds		137	738

7. Stock listing is discontinued. Last year's live stock is largely sold, dead stock is remaindered and written off.
8. The Balance Sheet is replaced with a List of Assets to Charity Commission Requirements supplemented as follows:

Item	**Acquired**	**Cost**
Display Boards	1976	371
Display Table	1989	69
Computer	1992/3	2,431
Projector and Screen	1996	1,130

RECORDERS 1998

Meteorology: Mr M.C. Williams, 2 Ivel Close, Barton-le-Cley, Bedford MK45 4NT
Geology and Palaeontology: Mr P. Smart, 46 Brecon Way, Bedford MK41 8DD
Mammals: Mr C. Tack, 1 Gate Cottage, Whipsnade Wild Animal Park, Dunstable LU6 2LR
Mammals (Bats): Ms J. Childs, 16 Judith Gardens, Potton SG19 2RJ
Dr A. Aldhous, 16 Judith Gardens, Potton, SG19 2RJ
Birds: Mr D. Odell, 74 The Links, Kempston, Bedford MK42 7LT
Bird Ringing Co-ordinator: Mr D.S. Woodhead, 8 Colworth Road, Sharnbrook, Bedford MK44 1ET
Reptiles and Amphibians: Mrs H. M. Muir-Howie, "Vivarium", 19 Molivers Lane, Bromham, Bedford, MK43 8JT
Fish and Crayfish: Mr H. Winter, 34 The Silver Birches, Kempston MK42 7TS
Grasshoppers and Crickets: Mr K. Sharpe, 22 Russett Close, Stewartby, MK43 9LG
Dragonflies: Mr S. Cham, 45 Weltmore Road, Luton LU3 2TN
Bugs (Heteroptera): Dr B.S. Nau, 15 Park Hill, Toddington, Dunstable, Beds LU5 6AW
Lacewing Flies: Dr B. Verdcourt, The Herbarium, Royal Botanic Gardens, Kew, Richmond, Surrey TW9 3AB
Butterflies: Mr C. Baker, 3 Holywell Close, Studham, Dunstable LU6 2PB
Moths (macro): Mr L Field, 24 Kingsdown Avenue, Luton LU2 7BU
Moths (micro): Mr D.V. Manning, 27 Glebe Rise, Sharnbrook, Bedford MK44 1JB
Hoverflies: Miss L. Smart, 273 Park Road, Luton LU1 3HH
Social Wasps: Mr R. Revels, 73 London Road, Biggleswade SG18 8EE
Bumblebees: Mr S. Halton, 7 North Avenue, Letchworth, Herts SG6 1DH
Flowering Plants, Ferns and Fern Allies: Mr C. R. Boon, 68 Mill Lane, Greenfield, Bedford MK45 5DF
Bryophytes: Mr A. Outen, 15 Manor Close, Clifton, Shefford SG17 5EJ
Lichens: Mrs F.B.M. Davies, "Rose Cottage", 69 The Hill, Wheathampstead, St. Albans AL4 8PR
Fungi: Mr A. Outen, 15 Manor Close, Clifton, Shefford SG17 5EJ
Sites: Miss R. Brind, c/o Bedford Museum, Castle Lane, Bedford MK40 3XD

Where a species is not covered by one of the Society's Recorders please pass the record on to Miss R. Brind, Bedford Museum, Castle Lane, Bedford MK40 3XD.

BEDFORDSHIRE NATURAL HISTORY SOCIETY

The Bedfordshire Natural History Society was formed in 1946 and its main function is to record the fauna and flora of the county. For this purpose it has over twenty active Recorders who cover many branches of natural history study and whose annual reports are published in *The Bedfordshire Naturalist*. Members also receive a quarterly newsletter, *The Muntjac* and programmes of meetings. These latter include field meetings to sites having a natural history interest within the county and occasional meetings further afield. During the winter months there are illustrated lectures, normally held at one of the following places : Toddington, Elstow, Haynes and Maulden. The Society depends on the annual subscriptions which are devoted to carrying out its work, as all officers are honorary. Membership is open to everyone, whether resident in the county or not.

THE BEDFORDSHIRE BIRD CLUB

The Bedfordshire Bird Club was set up in 1993 by birdwatchers, from both inside and outside the BNHS, to cater for their specialist needs. Its main functions are to record and document the avifauna within the county and to provide a forum for local birdwatchers. Members receive the annual bird report as Part 2 of *The Bedfordshire Naturalist* and also receive a bimonthly newsletter, *The Hobby*, and programmes of indoor and outdoor meetings. The winter meetings are held on the last Tuesday of the month between September and April at Maulden Village hall. Field meetings are equally spread between venues with a bird interest within the county and much further afield. The Club has a very active core of its membership participating in both locally and nationally organised surveys.

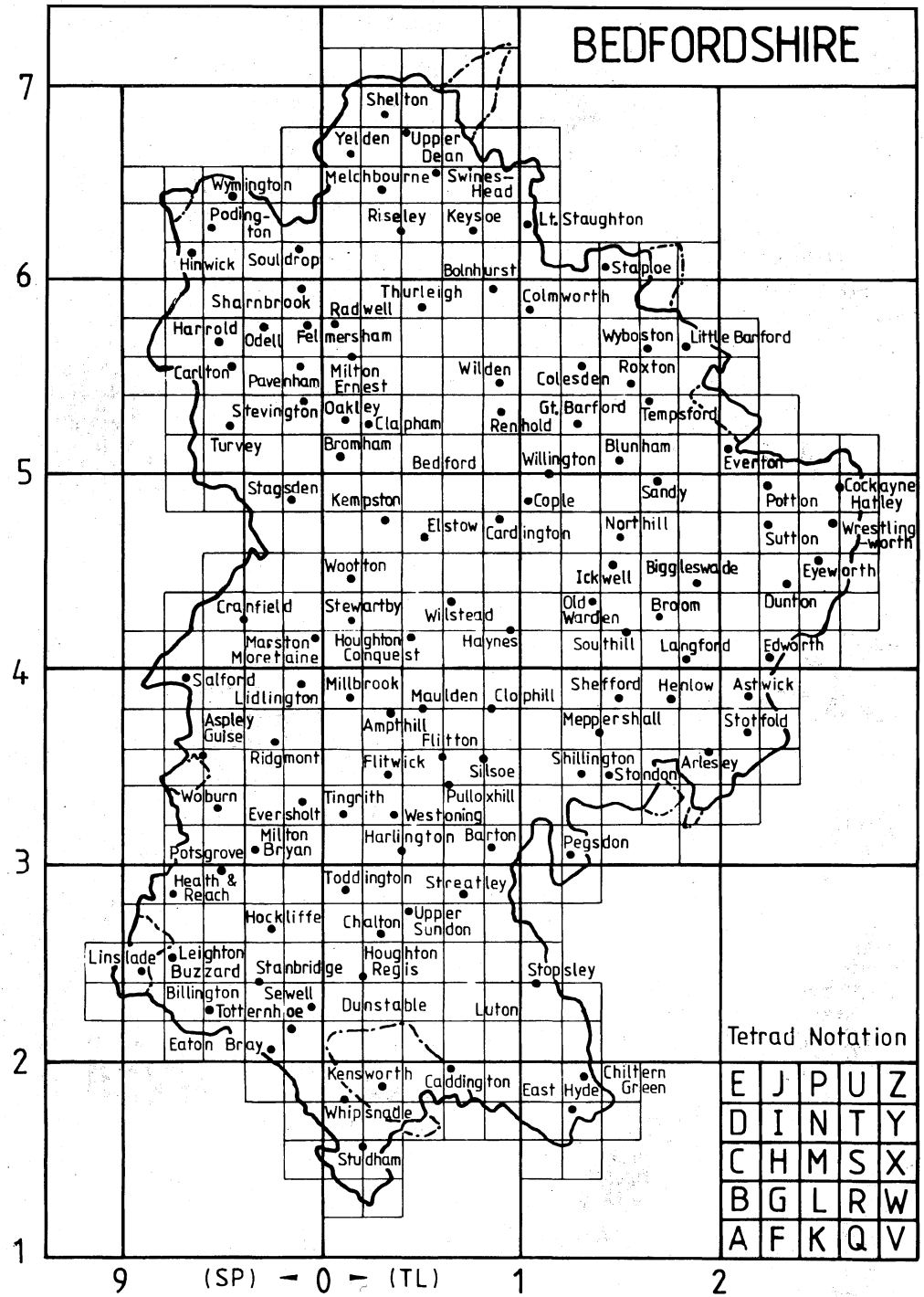
PUBLICATIONS

The Society has an excellent record of publications in addition to its annual Journal. *Bedfordshire Wildlife* published in 1987 gives a broad overview of our wildlife habitats, flora, fauna and geology. *The Bedfordshire Bird Atlas* maps the distribution of breeding birds within the county from 1968 to 1977, and this was followed by extensive fieldwork to produce the more recent *Atlas of the Breeding Birds of Bedfordshire 1988–92* *The Butterflies and Moths of Bedfordshire*, published in 1997, is the most comprehensive survey of the butterflies and moths of Bedfordshire ever produced, summarising the history and current distribution of more than 1,300 species found in the county as well as looking at changes in habitats and recent population studies.

MEMBERSHIP

For membership details of the Bedfordshire Natural History Society and the Bedfordshire Bird Club, write to:

Hon. Membership Secretary, 28 Chestnut Hill, Linslade, Leighton Buzzard, Beds LU7 7TR



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