Distribution of the adder (*Vipera Berus*) in the Brue Valley

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Extracted from the Proceedings of the Somerset Archaeological and Natural History Society for 2016.

Volume 160

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Produced in Great Britain by Short Run Press, Exeter.

1SSN 0081-2056

DISTRIBUTION OF THE ADDER (*VIPERA BERUS*) IN THE BRUE VALLEY, SOMERSET: RESULTS OF A SURVEY UNDERTAKEN IN 2015

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INTRODUCTION

The Adder (*Vipera berus*) exhibits many biological and ecological characteristics known to increase the vulnerability of a species to local extinctions (Corbett 1989). This, along with habitat loss and inappropriate habitat management, may be putting the Adder at particular risk (Wild and Entwistle 1997; Gent and Gibson 2003; Baker *et al*. 2004). In Britain, the Adder has a widespread but patchy distribution (Arnold 1995; Phelps 2004), with one third of populations in England containing as few as ten individuals (Baker *et al*. 2004). In Somerset, the species occurs in significant numbers on Exmoor (Anon. 2015), while on the Quantock Hills Adders are present, albeit with a fragmented population (Dickson 2012, 2015). Throughout the Mendip Hills the species has been recorded in significant but localised populations (Anon. 2015; J. Dickson, *pers. comm*.). In addition, the species has been regularly recorded in the Brue valley, with anecdotal evidence suggesting that it probably occurs here as small isolated populations.

Concerns about the conservation status of the Adder in Britain have been growing over the last two decades. A recent study in England (Baker *et al*. 2004) indicated a declining population, and worries about its status led to the species being listed in 2007 as a UK Biodiversity Action Plan Priority Species (JNCC 2016). There have been suggestions recently of reduced sightings of Adders in the Brue valley (Merrett, *pers. comm*.) although, prior to the present study, no formal investigation into its status had been undertaken. The lack of such an investigation has been a major stumbling block to devising and implementing a conservation management plan for the species in this area.

Adder populations, for the most part, consist of local 'colonies' that are faithful to a fixed hibernaculum (over-wintering site) or defined hibernation area (Malenoir and Pickett 1968; Prestt 1971; Phelps 2004). This fidelity to hibernacula can make the species vulnerable to inappropriate habitat management and stochastic catastrophic events (Wild and Entwistle 1997). Knowing the locations of hibernacula allows conservation effort to be focused and directed towards these important areas, and for this reason the present study had the identification of hibernacula as one of its priorities. After emerging from hibernation, Adders spend several weeks basking close to their hibernacula (Fig. 1), so records of Adders in early spring can help to reveal the locations of hibernacula (Prestt 1971).

Fig. 1 Basking male Adder; photo taken in March (© J. Crispin)

STUDY AREA

The Brue valley lies between the Liassic outcrops of the Polden Hills to the south and the Wedmore Ridge to the north. Drainage and peat-digging have destroyed most of this once large area of fen. All the land within the study area lies below the

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10m contour and registers soil pH values ranging between acid and neutral (Knowlton 1973; Hywel-Davies and Thom 1986; Langslow 1997). Our study of Adders was carried out at the eastern end of the Brue valley, part of a 12,500 ha landscape-scale conservation project coordinated by the Somerset Wildlife Trust. All the land is owned and/or managed by conservation organisations (Royal Society for the Protection of Birds (RSPB), Somerset Wildlife Trust (SWT) and Natural England (NE)), comprising Ham Wall National Nature Reserve (NNR)/Street Heath, Westhay reserve, Catcott reserve and Shapwick Heath NNR (Fig. 2). The northern part of Ham Wall and its satellite reserve of Long Drove were omitted from the survey; they had previously been surveyed for reptiles, with no Adders recorded (Blacker 2013), so it was decided to not commit any further (limited) volunteer-time to them.

The entire study area is under some of form of conservation management and contains isolated remnants of fen (about 10 ha), raised bog and wet heath (about 130 ha) that exhibit many of the characteristics associated with 'high suitability' Adder habitat (Anon. 2002; Edgar *et al.* 2010). The disused railway embankment, running east-west through a large part of the study area, not only offers suitable south-facing habitat for Adders but is also an important feature connecting other suitable habitats.

METHODS

The survey was conducted by 20 volunteer surveyors who were recruited through the conservation organisations responsible for land management in the study area. Volunteers were split into three teams roughly corresponding to the areas being managed by those organisations. Surveyors attended a training day on 22 March 2015 which included instruction on reptile survey methodology and recognition techniques. Survey methods broadly followed that of Foster (1999), using a combination of visual searches and 'artificial refugia', and with volunteers walking a pre-defined transect. Artificial refugia (usually comprising sheets of corrugated iron) were established at a frequency of 5-10 per ha, depending on the habitat, and were sited in sunny spots near to cover on short or flattened vegetation. Some suitable areas for refugia were avoided due to the proximity of public footpaths. Refugia were set out during the last week of January/first week of February and their locations were recorded using a hand-held Geographical Positioning System (GPS) device.

The first surveys were conducted in March, with weekly data collection continuing until early November (although several survey dates were missed due to inclement weather). Possible

Fig. 2 Location of Adder records from the 2015 study (some closely placed Shapwick Heath records are amalgamated). Catcott Reserve, to the far west, returned no Adder records during the 2015 study. The locations of hibernacula not differentiated to reduce the risk of disturbance and collection (Map Data © 2017 Google Imagery, Image © 2017 DigitalGlobe)

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hibernacula were identified by the presence of Adder assemblages in spring and/or autumn. For the purpose of this study, an 'assemblage' was defined as the presence of three or more Adders at the same place at the same time; while the location of an assemblage may not indicate the exact location of a hibernaculum, it does point to the likelihood of there being a hibernaculum in the vicinity (Phelps 2004).

The study design did not allow an accurate population census to be made, but a crude index of Adder abundance at each site was calculated by dividing the number of Adders recorded by the number of site visits (see Table 4). It was decided to record all reptile species, in part to provide data on their distribution within the study area, but also as a way of maintaining the interest of volunteers when few or no Adders were being recorded. Common Lizard (*Zootoca vivipara*), Slow Worm (*Anguis fragilis*) and Grass Snake (*Natrix natrix*) were present throughout the study area, but data on these species are not included in the present paper.

RESULTS

The study produced a total of 34 Adder recordings from 46 site visits, of which 22 (64.7%) were from Shapwick Heath (Table 1). There were eight records from Ham Wall/Street Heath (Table 2), four from Westhay (Table 3), and none from Catcott. Locations of all records are shown in Fig. 2. Most records (21) were in March-April, Adders being particularly visible during these months due to the spring 'lying out' phase; summer/autumn records also included several sightings of animals out in the open (as in Fig. 3).

Fig. 3 Male Adder crossing a path on the eastern part of Shapwick Heath; photo taken in July (© J. Crispin)

It was possible to identify the location of three hibernacula, one for each of the three sites that returned records. These are indicated in Tables 1-3, but without full GPS coordinates. The three male Adders recorded together on 6 November at Westhay had, unfortunately, been accidentally disturbed in the hibernaculum. Records between mid-April and early October were presumed to be of individuals in their summer feeding areas. Heavy rain during August and September resulted in most site visits being cancelled; and this, along with the height of the vegetation, resulted in no records for these months.

TABLE 1 – ADDERS RECORDED AT HAM WALL AND STREET HEATH. 22/10/2015 IS A PRESUMED HIBERNACULUM (RESOLUTION REDUCED TO AVOID DISTURBANCE). M = MALE; F = FEMALE; ? = SEX UNKNOWN (TOTAL NO. OF SURVEY VISITS = 13)

Date	Sex and No.	Grid Reference
06/04/2015	? x 1	ST4586439359
06/04/2015	? x 1	ST4592539232
01/05/2015	M x 1	ST4592539232
18/06/2015	? x 1	ST4573039750
04/07/2015	F x 1	ST4592539232
22/10/2015	? x 3	ST451**395**

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TABLE 2 – ADDERS RECORDED AT SHAPWICK HEATH. 22/03/2015 AND 30/03/2015 A PRESUMED HIBERNACULUM (RESOLUTION REDUCED TO AVOID DISTURBANCE). M = MALE; F = FEMALE; ? = SEX UNKNOWN (TOTAL NO. OF SURVEY VISITS = 18)

Date	Sex and No.	**Grid Reference**
22/03/2015	M x 3	ST423**411**
25/03/2015	M x 1	ST4234-4113-
25/03/2015	M x 1	ST4230-4120-
30/03/2015	? x 1	ST4242440145
30/03/2015	? x 10 (approx)	ST423**411**
01/04/2015	M x 1	ST4234-4115-
16/04/2015	M x 1	ST4233341141
15/06/2015	F x 1	ST4234841152
21/06/2015	? x 1	ST4483739604
20/07/2015	M x 1	ST4235-4116-
09/10/2015	? x 1	ST4192241072

TABLE 3 – ADDERS RECORDED AT WESTHAY. 06/11/2015 IS A PRESUMED HIBERNACULUM (RESOLUTION REDUCED TO AVOID DISTURBANCE). M = MALE; ? = UNKNOWN SEX (TOTAL NO. OF SURVEY VISITS = 8)

Date	Sex and No.	Grid Reference
20/04/2015	? x 1	ST4525543580
06/11/2015	M x 3	ST454**437**

DISCUSSION AND CONCLUSION

This study has confirmed that the species is present in all the surveyed areas apart from Catcott. Because the volunteer surveyors were not trained to handle Adders, there was no opportunity to conduct a capture/mark/recapture study to estimate the population. However, the data did allow for a crude estimation of population abundance (Table 4), which could prove helpful for comparing the three sites and as a reference point for future surveys, although, due to likely inherent biases, caution should be exercised when interpreting these values. Nevertheless, Shapwick Heath had a population index about twice that of the Ham Wall/Street Heath reserves, and more than twice that of Westhay (Table 4). Unfortunately, due to poor recording of the sex of individual Adders, no meaningful inferences on sex ratios could be drawn from the data.

TABLE 4 – INDEX OF ADDER ABUNDANCE (NO. ADDER SIGHTINGS ÷ NO. SITE VISITS)

Site	**No. of site visits**	**No. Adders recorded**	**Adder density/abundance index**
HamWall/Street Heath	13	8	0.62
Shapwick Heath	18	22	1.22
Westhay	8	4	0.50
Catcott	7	0	0.00

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It was hypothesised that the Brue valley Adder 'population' would prove to be a collection of small isolated sub-populations with little, if any, genetic flow between them (J. Dickson, *pers. comm.*). The data tend to support that hypothesis, suggesting that, for the most part, Adder distribution in the Brue valley should, at best, be regarded as 'patchy'. In particular, the population at Westhay is likely to be genetically isolated from those at Ham Wall/ Street Heath and Shapwick Heath, and so should perhaps be regarded as a discrete sub-population with the B3151 and the hamlets of Meare and Westhay forming effective barriers to movement and dispersal (Fig. 2). If this proves to be the case, the Westhay population may be at risk from the deleterious effects of inbreeding depression (see Madsen *et al.* 1996, 1999) with little prospect of viability in the long term. Those sub-populations at Ham Wall/Street Heath and Shapwick Heath, on the other hand, are best regarded as a single meta-population with opportunities for gene flow between the two sites. The long-term viability of this meta-population is likely to depend on continued maintenance of habitat connectivity between the two sites: any loss in connectivity could adversely affect the smaller (outlying) population at Ham Wall/Street Heath.

Despite a similar survey effort to that of Westhay, Catcott produced no Adder records; this despite the area containing suitable habitat and being connected to Shapwick Heath by land under conservation management. The lack of records from Catcott is a surprise, given that there were several records there in the 1990s and early 2000s (J. Dickson, *pers. comm.*). A further targeted survey at Catcott will be needed to confirm this result.

Because of the importance of hibernacula to the long-term survival of the species, this study aimed to identify their locations. All three areas holding Adders also surveyed 'positive' (under the criteria stipulated in the Methods) for hibernacula, although precise locations are not given here to minimise the chances of deliberate disturbance.

In conclusion, the results of this study suggest that Adder populations at Shapwick Heath and Ham Wall/Street Heath should remain viable as long as suitable habitat (and habitat *connectivity*) is maintained and hibernacula are afforded a degree of protection. The long-term viability of the isolated Westhay population is less certain, while the apparent absence of Adders at Catcott is concerning and would merit further investigation.

ACKNOWLEDGMENTS

The author would like to thank all those involved in this project, particularly Phil Thorpe (SWT) who conceived of the project, John Dickson (Reptile and Amphibian Group for Somerset) who provided the initial training for the volunteers, and the many volunteers who donated their time to collect the data. The project had the support of the staff and managers from the RSPB, SWT and NE reserves. Many thanks to John Crispin for allowing the author to use his Adder photos.

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