

**Report on a Series of Surveys to Map the
Distribution of The Adder (*Vipera berus*)
Within the Quantock Hills AONB in
Somerset.**

Spring 2011 – Spring 2015.

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Introduction

The adder is the fastest declining reptile species in Britain. Prior to 2008, records of sightings of adders (*Vipera berus*) and data on their distribution within the Quantock Hills AONB had been sparse and few studies had been conducted into the species on this range of hills.

Anecdotal evidence exists of a survey undertaken in 2002 jointly by the Reptile and Amphibian Group for Somerset (RAGS) and the Somerset Environmental Records Centre (SERC), followed by a further one in 2007 (Paul Newman, Mark Anderson *pers comm*). However, on both of these occasions the results appear to have been disappointing, with very few sightings of adders, contributing to a long-held perception that adders are rare on the Quantock range.

Such a sparse body of data leaves land managers on the Quantock Hills ill-equipped to administer the management regimes necessary to conserve the species (Palmer 2009).

In an effort to rectify this deficiency, the Quantock Hills AONB Service, together with other interested parties, commissioned Kevin Palmer to undertake a study into the status and distribution of the adder on the Quantocks.

The Quantock Hills AONB covers an area of 98km² and reaches elevations of up to 350m above sea level. The high plateau of the hills is composed chiefly of heathland, dominated by heathers (*Calluna spp*), gorse (*Ulex spp*) and moor grasses, a habitat often considered optimal for adders.

Within the AONB Palmer's study identified four sub-populations of adders: one on Thornecombe Hill, where thirteen males and three females were identified; another at Wilmot's Pool, where seven males and five females were identified; a further one on Black Hill, where three males were identified but no females; and finally one on Great Hill where adders were present but no data was collected to enable recognition of individuals. The author was careful to point out that these quantities do not constitute reliable population size estimates and that further mark and recapture effort would be required to reach any conclusions on population size (Palmer 2009). They do, however give an insight into the distribution of sub-populations on the hills.

In 2011, the Quantock Hills Species Action Plan (SAP) for adders was published including a target to build on knowledge of adder distribution and populations on the Quantock Hills. As a key partner in the implementation of the SAP, RAGS shared the responsibility for meeting this target and consequently began a programme of surveys, beginning in spring of 2011 and repeated each subsequent spring until 2015. The aim was to build on the data collected by Palmer and his collaborators to increase the understanding of the distribution of adders within the AONB.

Information on the distribution of adders across the range of hills is important as it allows informed decisions to be made on best land management practices. On the Quantocks burning, or swaling, is traditionally the method of choice for managing the heathland, a practice known to be detrimental to reptile populations (Jofre and Reading 2012). Swaling affects adders in two ways: directly, by burning individuals, and indirectly by destroying their habitat. On the Quantocks most of the swaling occurs while adders are underground hibernating, therefore direct mortality may be low. However animals surviving the direct effects of the fires are then exposed to an increased threat of predation on emergence, due to the loss of vegetation cover.

Within an adder population the hibernaculum is a feature of particular importance, being the focus of the population and the place where the animals spend most of their time. Consequently RAGS were particularly anxious to identify hibernation sites so that they can be taken into account by the AONB Service when preparing swaling plans.

During early spring, adders emerge from their hibernacula and spend the next few weeks 'lying out' in close proximity to the hibernacula. Consequently, observations of adders during this time can indicate the likely position of hibernacula.

Due to the obvious constraints when working with venomous animals, surveyors were not encouraged to handle snakes. Consequently surveys sought simply to establish presence or absence of snakes, particularly assemblages of snakes, in a number of localities on the hills, identify the sex of those encountered and where possible to photograph each specimen for potential future reference.

During the course of the surveys it was observed that the adders on the Quantocks appear to be smaller than those found elsewhere. To test this observation, morphometric data were collected by competent handlers, from a series of adders both on the Quantocks and on the Mendip hills for comparative analysis.

Materials and Methods

Protocols for the surveys were drawn up in the first year of surveying and with minor amendments, have broadly followed the same techniques in all subsequent years.

Volunteer surveyors are recruited from among existing RAGS members but also from volunteer groups associated with other conservation organisations such as the AONB Service, Somerset Wildlife Trust and the National Trust.

In consultation with the staff of the AONB Service, sites consisting of individual 1km squares were identified for surveying (Table 1) and are shown in Figure 1.

A training day was held for the surveyors each year in mid-March, to familiarise them with reptile survey and recognition techniques and how to record relevant data.

During the training days, the surveyors were divided into small groups and each group allocated a 1km square to survey. Management of time was delegated to the groups themselves but each group was requested to complete a minimum of three visits to their allocated site, in appropriate weather conditions, before the survey ended. Each group was also issued with a hand-held GPS system to accurately record the location of adder sightings

Each year the survey began with the training day in March and ended on May 31st by which time adders have dispersed from their hibernation sites and become increasingly difficult to find.

The surveying technique is very simple. Surveyors first need to identify potential adder habitat within their 1km square. During a period of suitable weather conditions, they then traverse the area quietly and methodically, searching for basking adders. Once an adder is found participants record its position using the GPS, identify its sex and life stage and record simple details of the vegetation structure around the basking site. Where possible a photograph is taken of the individual.

When the visit is completed, or perhaps whilst out in the field, the surveyors are requested to complete the recording form (Appendix 2). This gives details of the individual sightings, the vegetation structure and, in an attempt to estimate the density of adders on each site by quantifying the man-hours expended per sighting, both the duration of the visit and the number of surveyors present.

In a connected study, morphometric data were collected from a series of adders on the Quantock hills and a series on the Mendip hills for comparison. Adders were captured and three measurements were taken, snout to vent length (SVL), total length (TL) and weight, before being immediately released where they were found.

These three data were then compared between the two groups using one way ANOVA statistical tests. In order to reduce any error introduced by potentially gravid animals, only data from adult males were compared.

Year	1km² Grid Reference	Site Name
2011	ST1139	Bicknoller Hill
	ST1240	Bicknoller Post, West.
	ST1338	Halsway Hill
	ST1339	Black Ball Hill
	ST1340	Longstone Hill
	ST1341	East Quantoxhead
	ST1436	Great Hill West.
	ST1438	Black Hill
	ST1536	Great Hill
	ST1537	West Hill
	ST1538	Frog Hill/Wilmot's Pool
	ST1638	Dead Woman's Ditch North.
	ST1735	Aisholt Common West.
	ST1835	Aisholt Common East.
2012	ST1140	Weacombe Hill West
	ST1141	Vinny Combe
	ST1240	Weacombe Hill to Beacon Hill
	ST1241	West Quantoxhead
	ST1242	West Hill
	ST1635	Wills Neck to Triscombe Stone
	ST1734	Lydeard Hill
	ST1735	Aisholt Common W.
2013	ST1139	Bicknoller Hill
	ST1140	Weacombe Hill W.
	ST1239	Thornecombe Barrow to Bicknoller Combe
	ST1240	Weacombe Hill to Beacon Hill
	ST1242	West Hill
	ST1339	Black Ball Hill
	ST1341	East Quantoxhead
2014	ST1832	Cothelstone Hill W.
	ST1932	Cothelstone Hill E.
	ST2132	Broomfield Hill S.
	ST2133	Broomfield Hill N.
2015	ST1139	Bicknoller Hill
	ST1142	Old Deer Park
	ST1240	Weacombe Hill to Beacon Hill
	ST1241	West Quantoxhead
	ST1242	West Hill

Table 1: 1km squares identified for survey.

Results

Over the five year period more than 100 surveyors have been trained in survey techniques for adders and a total of twenty-six 1km squares have been surveyed (Figure 1), of which 17, or 65%, yielded sightings of adders. Sloughed skins have been recovered from three of the squares, although in one of the squares where a sloughed skin was recovered, there were no sightings of adders.

The resulting records for each year of the survey are shown in Appendix 1 and summarised in Table 2.

A total of 65 sightings of adders have been recorded: 14 in 2011, 15 in 2012, 12 in 2013, seven in 2014 and 17 in 2015. Additionally seven sloughed skins have been recovered. A further seven ambiguous records were excluded from the results, two in 2011 and five in 2012.

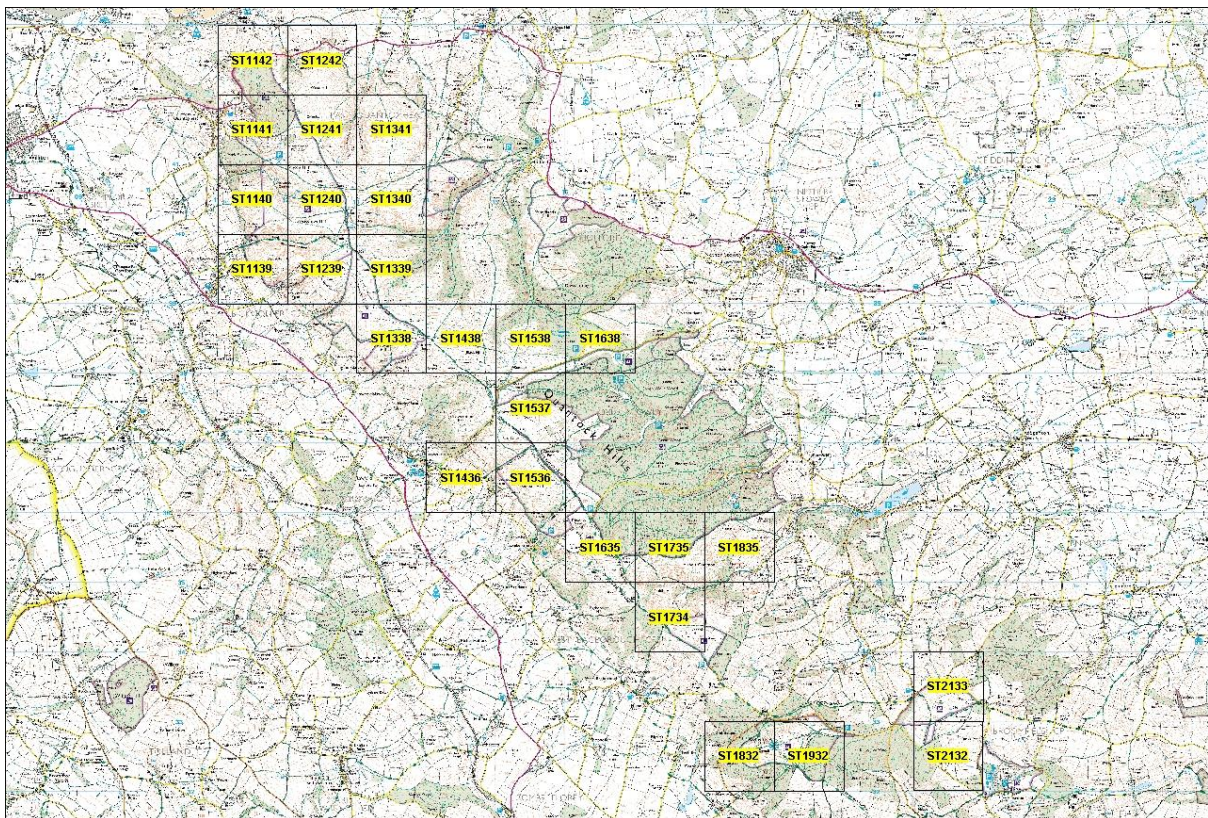


Figure 1: Grid squares surveyed 2011 – 2015.

Grid Square	Adder Sightings			Skins
	Male	Female	Unknown	
ST1139	1		1	
ST1140	1			
ST1141	4		1	
ST1142	5			
ST1239	1			
ST1240	10	2		5
ST1241	3	1	1	1
ST1242			1	
ST1338	2	1		
ST1341				1
ST1436	1	1		
ST1438	1			
ST1536		3		
ST1538		3		
ST1635	6	2		
ST1734	3	3		
ST1932	4			
ST2133		3		
Total	42	19	4	7

Table 2: Adder sightings by 1km grid squares.

The location of each of the adder sightings has been plotted according to the year they were made in Figure 2.

In order to present a comprehensive view of current understanding of the distribution of adder assemblages on the Quantock range Figure 3 shows the results of the RAGS surveys plotted alongside all the previous records collected since 2005. Maps produced here are at a landscape scale. However, if finer detail is required it is available from the Quantock AONB Service on request.

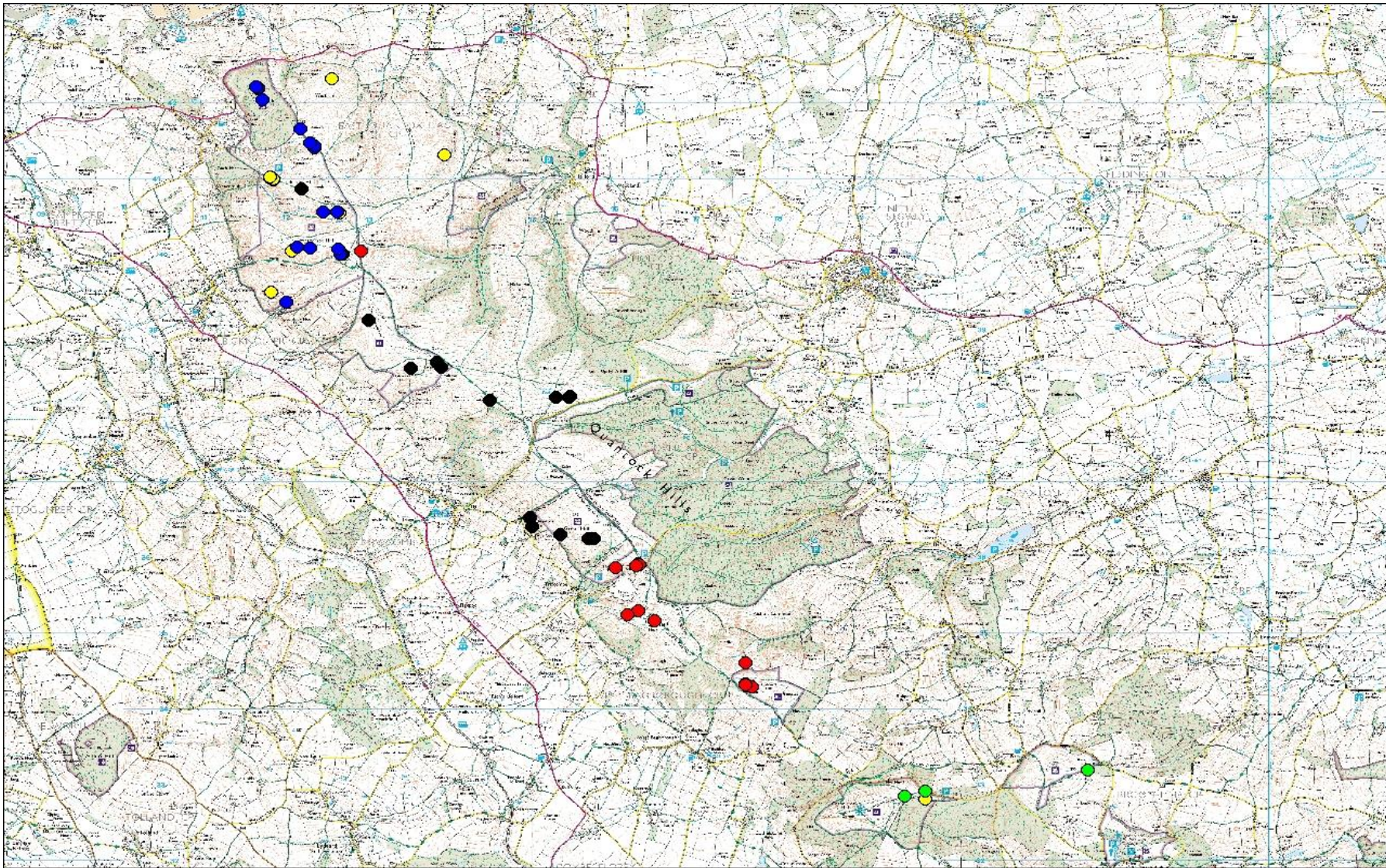


Figure 2: Results by year. 2011 in black, 2012 in yellow, 2013 in red, 2014 in green and 2015 in blue.

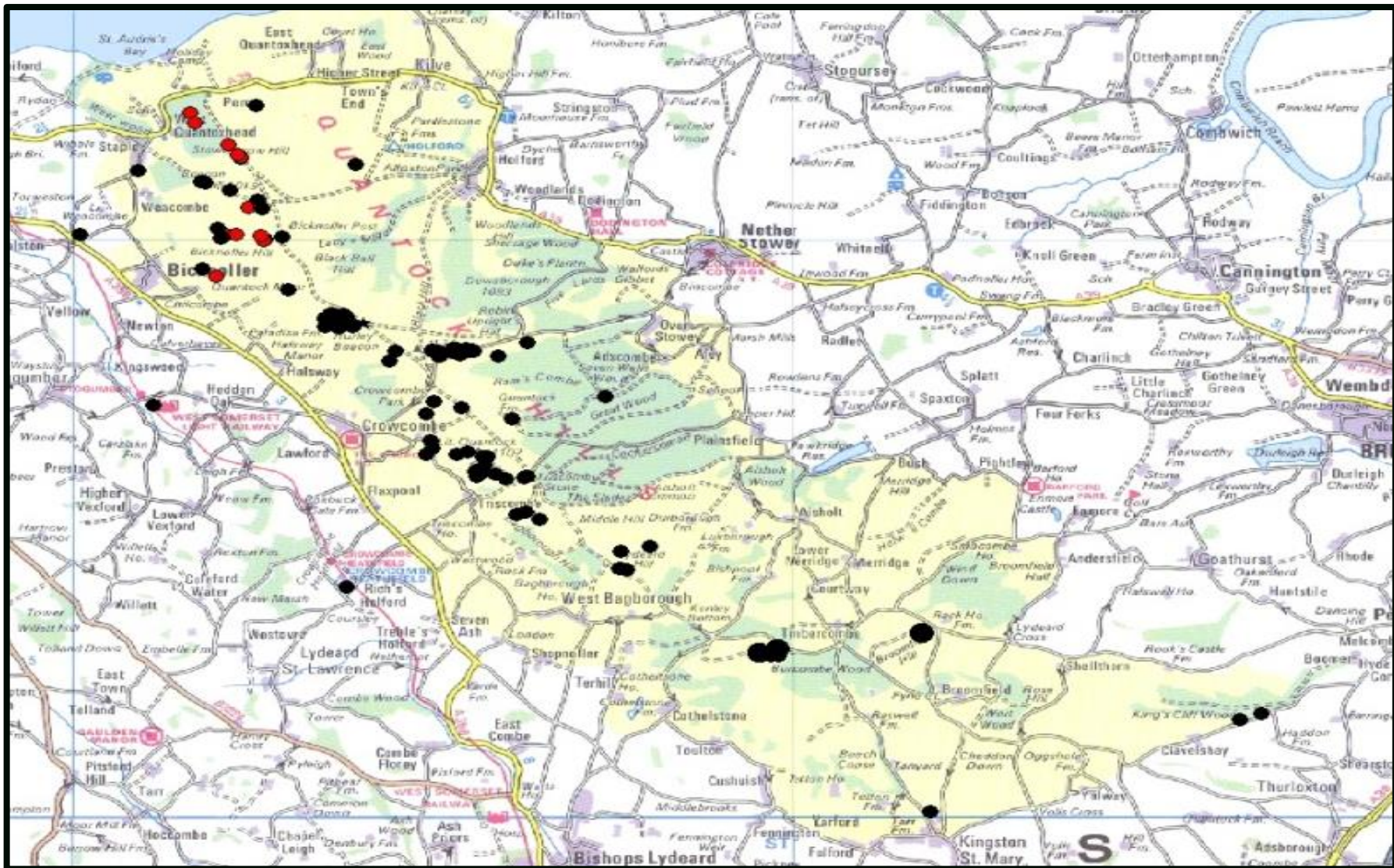


Figure 3: All adder records collected in the Quantocks since 2005. 2015 records in red.

The maps show that during the spring lying out period adders are found in discrete assemblages distributed in an arc along the south west facing slopes from Cothelstone Hill in the south to West Quantoxhead in the north.

In an attempt to estimate the density of adders on each site, the number of man hours expended per sighting are set out in Table 3. This data was not collected during 2011, therefore only squares surveyed subsequently are represented.

Grid Square	Total Man Hours	Total Sightings	Hours per Sighting
ST1139	14.40	2	7.20
ST1140	65.25	1	65.25
ST1141	4.00	5	0.48
ST1142	4.00	5	0.48
ST1239	12.15	1	12.15
ST1240	63.36	12	5.18
ST1241	28.15	5	5.36
ST1242	8.15	1	8.15
ST1339	5.00	0	N/A
ST1341	1.00	0	N/A
ST1635	29.00	8	3.37
ST1734	28.00	6	4.40
ST1735	12.15	0	N/A
ST1932	16.00	4	4.00
ST2133	19.30	3	6.30

Table 3: Number of man hours expended per sighting for each site.

Comparisons of the morphometric data collected from adders on both the Quantock and the Mendip ranges are shown in Table 4.

Due to their relative scarcity, the Quantock series is smaller than that from the Mendips. Nevertheless, both series are large enough for meaningful comparison and the results show that the means are greater for the Mendip population in all three categories, SVL, TL, and body weight. However, Table 5 shows that once analysed using an ANOVA statistical test, only the difference between body weight is statistically significant between the two populations, those on the Quantocks being of comparable length, across the population, to those on the Mendips but significantly lighter ($p = 0.000$).

SVL	Site	N	Min	Max	Mean	ST Dev
	Quantock Hills	43	336mm	504mm	406.23mm	37.47
	Mendip Hills	80	80mm	540mm	413.71mm	60.77
TL	Quantock Hills	43	396mm	570mm	471.05mm	42.05
	Mendip Hills	80	145mm	625mm	482.21mm	65.36
Weight	Quantock Hills	40	31.00g	84.00g	54.85g	14.25
	Mendip Hills	63	37.00g	138.00g	74.61g	17.73

Table 4: Comparative statistics for samples of adders collected from the Quantocks and the Mendips. SVL= snout to vent length, TL = total length.

Source of Variation	Df	F	P
SVL	122	0.54	0.464
TL	122	1.02	0.313
Weight	102	35.21	0.000

Table 5: Results of ANOVA statistical tests for SVL, TL and weight.

Discussion

At the outset, the perception persisted that adders were rare on the Quantocks. Our surveys have shown them not to be as scarce as initially feared. However, neither are they as abundant as they are at other sites across the county, notably the Mendips, where comparable data exist.

Distribution of spring assemblages

The object of the RAGS surveys was to identify the hibernation areas of adders within the Quantock Hills AONB. In some parts of the country adders will return in considerable numbers to the same permanent crevice to hibernate year after year, and with a bit of diligence the exact location of the hibernaculum, even the opening into the hibernaculum, can be identified. However, this is not always the case, particularly in the heathland landscape found on the Quantock Hills, where permanent crevices or fissures are rare. Instead, most adders on the Quantocks are probably using transient holes such as the burrows of small mammals or gaps under the roots of plants, and while they may return to the same vicinity to hibernate each year they will not necessarily use the same hole each year and neither will they necessarily 'den up' together in large numbers. The attraction of a hibernation area for adders is primarily its orientation to ensure maximum exposure to the winter sun, its elevation and incline to prevent winter flooding and its vegetation cover to allow cushioning from frosts whilst also providing gaps that can act as sun traps for basking late in the autumn and early in the spring. Thus, adders will return to the same area to hibernate year on year, but where there is not one large focal hibernaculum, individuals may utilise a small burrow either alone, or in relatively small numbers, while nevertheless being aggregated in one area. This makes it difficult to pinpoint hibernacula and often the best that can be expected is to identify hibernation slopes.

In most cases the RAGS surveys have simply identified hibernation slopes. However, where an assemblage of adders has been found across a relatively localised area, the centre point of the assemblage is highlighted with a six figure OS grid reference. This does not necessarily mean that the point highlighted is the location of a single hibernaculum, but simply that burrows are probably being utilised in the immediate vicinity.

Prior to RAGS beginning this series of surveys in 2011, Palmer had identified four spring assemblages of adders within the AONB, one on the south west facing slopes of Thorncombe Hill, one in the vicinity of Wilmot's Pool, another on Great Hill and one on Black Hill.

For the purposes of this report an assemblage is defined as an area in which more than three adders have been found that, it is believed, can be assigned to different individuals.

The RAGS surveys have been able to confirm the presence of Palmer's assemblages on Thorncombe Hill, Great Hill and at Wilmot's Pool. However, our surveys of Black Hill have

only yielded a single sighting. Palmer himself only identified three individual snakes here, all of which were males, and suggested that this may be a small, or 'remnant', assemblage. Our results would appear to concur with his assessment that the population in this area is small.

A further nine assemblages have been identified during RAGS surveys, while another four sites have either yielded fewer than three adders, or where larger numbers have been found they cannot confidently be assigned to different individuals. Further surveys may confirm these sites to contain assemblages as defined in this context.

The southern-most assemblage identified by RAGS is on Cothelstone Hill in grid square ST1932. The site was surveyed in 2014 during which four adders were sighted. Sightings centred around the vicinity of the junction of the two footpaths on the eastern end of Cothelstone Hill, close to the North West corner of Buncombe Wood.

To the north of Cothelstone Hill a further assemblage was identified on Lydeard Hill in grid square ST1734 where six sightings were made during 2012. All these sightings were made in the south east corner of the square, straddling the boundary of the AONB, on the south-west facing slope of the hill.

Another assemblage was discovered in 2012 in grid square ST1635 when six sightings were made in the vicinity of Triscombe stone, just north of Triscombe quarry, with two further individuals sighted south of the quarry at Wills Neck.

A further five adders were sighted approximately 600m to the north of Triscombe Stone on the southerly facing slope of Great Hill just below the summit cairn, confirming Palmer's observations that there is another assemblage in this area.

Further north still, Palmer's observation of an assemblage around Wilmot's Pool is confirmed by the sighting of three adders during surveying of the site in 2011.

Approximately two kilometres north-west of Wilmot's pool there is a large assemblage on the south-west facing slope of Thornecombe Hill. While this site was not formally surveyed by RAGS, it has been used by RAGS as the location for the survey training days each year since 2011. During the 2011 season a total of thirteen sightings were made here during training events, and adders have been found here during training days in each subsequent year with the exception of 2015, when weather conditions were not suitable on the day. This is clearly an important site for adders on the Quantocks. The population on this site occupies the slope west of Halsway Post running north towards Thornecombe Barrow, adders being found predominantly west of the main footpath.

North of Thornecombe Barrow, on West Quantoxhead, the distribution of assemblages becomes more complex. There are no obvious obstructions to adder dispersal across the landscape, therefore there is probably considerable connectivity and interaction between apparent assemblages, and their close proximity to one another suggests that they are

unlikely to be discrete subpopulations. Nevertheless, patterns of distribution are evident, at least during the spring lying out period, probably indicating hibernation sites.

Both Bicknoller Combe and Weacombe Combe in the southern area of West Quantoxhead are clearly important sites for the species. Two assemblages have been identified on the south facing slope of Weacombe Hill, where it drops sharply down to form the northern slope of Bicknoller Combe, while a further two assemblages have been identified on the south facing slope of Beacon Hill, where this drops down to form the northern slope of Weacombe Combe.

One of the assemblages in Bicknoller Combe is centred around grid reference ST126400 at the eastern end of the combe. A single sighting about 500m south of Bicknoller Post in 2012, followed by a further sighting in the area in 2013, led to a formal survey of this region in 2015 when five individuals and two sloughed skins were found clustered in the vicinity of this grid reference.

The second apparent assemblage in Bicknoller Combe is situated approximately 600m west of the first, again on the northern slope of the combe, centred around grid reference ST120400, where three individuals were found in 2013, followed by a further three in 2015, although it is believed that one of the 2015 sightings may have been a duplicate sighting of the same animal.

Approximately 600m north of Bicknoller Combe, separated only by Weacombe Hill, lies Weacombe Combe, the northern boundary of which is formed by the south facing slope of Beacon Hill dropping down. On this south facing slope a further two assemblages have been identified.

The first of these is situated at the eastern end of the combe, centred around grid reference ST126405, where five adders were sighted in 2015 along with the discovery of two sloughed skins. The second is at the western end of the combe approximately 100m south of Staple Plain car park, centred around grid reference ST117410. This assemblage was identified in 2013 when six adders were found in the vicinity.

Approximately 600m north of this, another assemblage was discovered in 2015 when three adders were sighted coiled up together on a small heather covered bank just north of Vinny Combe Plantation, together with a further two individuals and a sloughed skin a short distance south-east of here. In this case, the characteristics of the bank, located at grid reference ST12148 41660, lead us to believe that the bank itself is the hibernaculum (Figure 4).

The final assemblage that the surveys have identified is located within the forested area of the old deer park. Here five adders were sighted, basking on the edges of the wide forest tracks and rides around grid reference ST116422.

A useful side effect of the surveys has been the increased awareness of the adders on the Quantocks and the importance of reporting observations. This has been demonstrated by reports submitted by the public to RAGS over the five year period, including records of three adders, complete with photographs, from this area within the woodland of the deer park in 2011, prompting further survey work in the area.

There were three locations where adders were sighted during surveys but where it is not yet clear whether they constitute assemblages. Three sightings occurred on Broomfield Hill in the south of the range during 2014, but it is believed that these were duplicate sightings of the same individual. Adders have also been sighted on two occasions on Bicknoller Hill in grid square ST1139, one during 2012 and another in 2013, while a single adder was sighted on West Hill in grid square ST1242 in 2013. These sites all require further investigation to determine their status.



Figure 4: Hibernation bank on West Quantoxhead.

Estimating density

During the first year of surveying it became apparent that it would be useful to have a rough estimate of the density of adders in any particular grid square. Surveyors are not trained in handling adders, therefore a mark and recapture study is not possible; so it was decided instead to collect data from each square on the number of man hours expended searching per sighting. Data collection began in 2012, the second year of surveying. This is certainly an imperfect method; there are many potential sources of error which might undermine its effectiveness. Perhaps greatest among these are variations in surveyor experience and expertise and the potential for duplicate sightings of the same individual.

Many of the surveyors have returned year on year to join the RAGS surveys. Some have done so since the first survey in 2011, becoming highly experienced and effective whilst also gaining a feel for whether a sighting is a duplicate or not. However, this cannot guarantee that all duplicates have been recognised and caution should be exercised when interpreting results.

Nevertheless, an interesting comparison can be made between the results for grid squares ST1140 and ST1240 in Table 3. Although the total effort expended in each square has been comparable, it has taken sixty-five hours and twenty-five minutes of surveying per sighting in square ST1140, while in square ST1240 it has taken five hours and eighteen minutes of surveying per sighting, suggesting that one square has a greater density of adders than the other and should therefore be considered more important for the species. It is probably too early to draw any definitive conclusions on the merits of this method and it should be borne in mind that the results refer only to the spring lying out period. For example, grid square ST1141 has been shown to contain an assemblage close to the boundary with square ST1140, so it is quite conceivable that later in the season, after dispersal, the density of adders in the neighbouring square may increase. As yet, nothing is known about the summer, post-dispersal distribution of the species on the Quantocks.

Habitat occupation and conservation.

With the exception of the one in the woodland of the deer park, all the assemblages identified to date share a number of habitat features. They are found on south or south-westerly facing slopes, all on heathland and all in areas where there is a structural diversity of vegetation. Adders favour edge habitats, the interface between one habitat and another, especially where the margin is between tall dense vegetation providing cover and a short sward allowing sunlight to reach the ground. In many areas of the hills, heather and gorse exist in extensive dense, uniform expanses. However these areas are not favoured by adders, at least during the spring, because although they provide cover they do not provide many edges and thus few opportunities to emerge and bask.

The assemblages are found where there is a small-scale mosaic of dense cover and open sunny edges; essentially places where clumps of mature heather and gorse exist in a matrix of moor grasses, and particularly where this structure coincides with small scale topographic variations or focal points such as ditches, banks or gullies.

Mature heath, over 15 years old, is essential and it is noticeable that where a small fragment of mature heath occurs amongst an expanse of immature heath the adders will be clustered in the mature fragment. One explanation may be that the thick beds of mosses and lichens that develop in and around clumps of mature heath provide important humidity and cooler retreats than simple shade (Edgar *et al.* 2010).

Therefore, management should seek to provide a fine-scale mosaic of clumps of dense, mature cover separated by narrow expanses of short sward. This presents a clear dilemma for land managers on the Quantocks where burning or swaling is the preferred method of management. Swaling does not lend itself to creating small scale mosaics of habitat and the swaling of hibernation sites is likely to render them uninhabitable by adders for many years, while a lack of management will allow scrub encroachment and the eventual loss of the hibernation site through excessive shading.

In order to resolve this dilemma, I would recommend discussion between the AONB service and the Amphibian and Reptile Conservation Trust, who have extensive experience of managing heathland sites for reptile conservation. If necessary, RAGS could facilitate this process by making the appropriate introductions.

The assemblage that provides the exception in terms of habitat is the one in the old deer park which exists in a forest setting where the edges of the wide open rides provide the interface habitats much used by the adders. The hibernaculum in this case is likely to be along one of these edges where the sunlight requirements are met, rather than within the dense tree cover. Surveyors in the area have expressed concern that recent forestry work has resulted in heavy vehicle damage to these edges. Further work should be focussed on identifying individual hibernacula in this area, to ensure their protection.

Size and body condition

The results of the comparisons between adder morphometrics from the Quantocks and the Mendips are interesting. While there is no significant difference between the lengths of adders from either range, those on the Mendips are significantly heavier than their Quantock counterparts.

This may be an important finding; body condition is likely to have a profound effect on survivorship, particularly during hibernation, when the animals are dependent on reserves of body fat. Additionally, although data was only analysed from male snakes, if this pattern is also true of females it is likely to have an impact on their reproductive potential.

This discrepancy is currently unexplained but an explanation should be sought because it may produce some insight to the reasons that adders are relatively scarce on the Quantocks.

Further work

There is much more useful work that can be done.

Efforts to explain the differences in body mass between adders on the Quantocks and the Mendips might consider the range of prey species available and their abundance at each site together with differences in land management techniques and the age structure of the two populations.

Surveys should continue. One priority might be to locate any hibernacula in the woodland of the deer park, to ensure their protection.

With few exceptions, surveys have to date been restricted to the heathland plateau of the Quantock Common and even here there are still a number of areas that might support populations of adders but which have not yet been surveyed. Several leads exist which should be followed and further survey work could be undertaken where small numbers of adders have been sighted, but where it is not yet clear whether they constitute an assemblage.

Beyond the heathland, on the 'shoulders' of the hills the habitat changes, yet there is a considerable volume of anecdotal evidence that adders are also found in some areas on these lower slopes where the habitat consists of the corners of rough grazing land, bracken covered slopes and the edges of wooded coombes. While not recognised as such typical adder habitat as the heathland on the plateau, it is entirely possible that areas of equal importance for adders could exist at these lower altitudes and it could be beneficial if future surveys were to include such areas.

Where assemblages have been identified, little is known about their size or structure, or the adders' seasonal dispersal patterns and in the longer term, future effort may usefully be focussed on gaining population estimates as well as data on how the adders use the hills. In the Wyre Forest in Worcestershire much valuable information is currently being collected on adder dispersal using radio telemetry. With a large expanse of ground managed by a single organisation rather than many different land holdings, the Quantocks would appear to lend themselves to this technology, and if the necessary legal requirements could be met, there might be a useful research project here for a capable student.

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APPENDIX 1. Survey Results

Year	Date	Grid Reference ST	Location	Number	Life stage	Sex
2011	23 rd March	14465 38080	Black Hill	1	Adult	Male
	2 nd April	15444 38119	Wilmot's Pool	1	Adult	Female
	7 th April	13876 38509	Halsway Hill	1	Adult	Male
	7 th April	12993 39134	Thornecombe Hill	1	Adult	Male
	7 th April	13826 38580	Halsway Hill	1	Adult	Female
	9 th April	15281 38114	Frog Hill	1	Adult	Female
	16 th April	15746 36250	Great Hill	1	Adult	Female
	16 th April	15680 36251	Great Hill	1	Adult	Female
	22 nd April	15331 36301	Great Hill	1	Adult	Female
	24 th April	15448 38125	Wilmot's Pool	1	Adult	Female
	25 th April	12167 40868	Beacon Hill	1	Adult	Female
	6 th May	135 385	Thornecombe Hill	1	Adult	Male
	3 rd June	14982 36400	Great Hill	1	Adult	Female
	3 rd June	14965 36524	Great Hill	1	Adult	Male
2012	1 st April	17602 34312	Lydeard Hill	2	Adults	1X Male, 1X Female
	1 st April	17611 34304	Lydeard Hill	1	Adult	Male
	6 th April	16009 35869	Triscombe Stone	1	Adult	Female
	6 th April	16290 35911	Triscombe Stone	1	Adult	Male
	6 th April	16298 35904	Triscombe Stone	1	Adult	Male
	6 th April	16256 35896	Triscombe Stone	1	Adult	Male
	6 th April	17593 34320	Lydeard Hill	1	Adult	Male
	6 th April	17601 34312	Lydeard Hill	1	Adult	Female
	8 th April	16256 35896	Triscombe Stone	1	Adult	Female
	8 th April	16290 35911	Triscombe Stone	1	Adult	Male
	22 nd April	16175 35240	W. of Wills Neck	1	Adult	Male
	12 th May	16486 35164	Wills Neck	1	Adult	Male
	12 th May	12893 40051	S. of Bicknoller Post	1	Adult	Male
	19 th May	17683 34284	Lydeard Hill	1	Adult	Female
2013	1 st April	12632 40550	Weacombe Combe	1	Adult	Male
	7 th April	12045 40047	Bicknoller Combe	1	Adult	Male
	7 th April	12067 40059	Bicknoller Combe	1	Adult	Male

	15 th April	12043 40047	Bicknoller Combe	1	Adult	Male
	20 th April	12535 42330	West Hill	1	Adult	Unknown
	21 st April	11801 39512	Bicknoller Hill	1	Adult	Male
	27 th April	11779 41021	Weacombe Combe	1	Adult	Male
	27 th April	11789 41020	Weacombe Combe	1	Adult	Unknown
	4 th May	11826 40994	Weacombe Combe	1	Adult	Male
	4 th May	11787 41018	Weacombe Combe	1	Adult	Male
	4 th May	11809 41014	Weacombe Combe	1	Adult	Male
	4 th May	11795 41021	Weacombe Combe	1	Adult	Male
	6 th May	13919 41317	Dens Combe	1	Skin	Unknown
2014	22 nd March	19543 32843	Cothelstone Hill	2	Adults	2X Males
	9 th April	19543 32843	Cothelstone Hill	1	Adult	Male
	5 th May	21796 33189	Broomfield Hill	1	Adult	Female
	17 th May	21796 33189	Broomfield Hill	1	Adult	Female
	26 th May	21796 33189	Broomfield Hill	1	Adult	Female
	27 th July	198 329	Cothelstone Hill	1	Subadult	Male
2015	22 nd March	11633 42211	West Quantoxhead	1	Adult	Male
	22 nd March	1163 4220	West Quantoxhead	1	Adult	Male
	6 th April	12330 41419	West Quantoxhead	1	Adult	Male
	6 th April	11613 42216	West Quantoxhead	2	Adults	2X Males
	6 th April	11696 42044	West Quantoxhead	1	Adult	Male
	9 th April	12430 40569	Weacombe Combe, East	1	Skin	Unknown
	9 th April	12603 40563	Weacombe Combe, East	1	Skin	Unknown
	12 th April	12319 41438	West Quantoxhead	1	Adult	Male
	12 th April	12148 41660	West Quantoxhead	3	Adults	1X Male, 1X Female, 1X Unknown.
	12 th April	12277 41485	West Quantoxhead	1	Skin	Unknown

	12 th April	11982 39371	Bicknoller Hill	1	Adult	Unknown
	19 th April	12668 40005	Weacombe Hill	1	Adult	Male
	19 th April	12661 40018	Weacombe Hill	1	Adult	Male
	19 th April	12639 40013	Weacombe Hill	1	Adult	Male
	23 rd April	12115 40106	Weacombe Hill	1	Subadult	Male
	23 rd April	12660 40012	Weacombe Hill	1	Skin	Unknown
	23 rd April	12649 40014	Weacombe Hill	1	Skin	Unknown
	23 rd April	12645 40004	Weacombe Hill	1	Skin	Unknown
	4 th May	12611 40071	Weacombe Hill	1	Adult	Female
	4 th May	12271 40095	Weacombe Hill	1	Adult	Male

APPENDIX 2. Survey Recording Form

ADDER SURVEY RECORDING FORM

Please complete a form for each visit and for each adder sighting.

Part One – Surveyors Details	
Date of visit:	Group Number:
Surveyors Present:	Time of survey: From: To:
Part Two – Site Details	
Grid square, or site name: ST	Weather conditions:
Part Three – Adder Sighting	
Number of Adders seen: (Please include nil)	If you have answered nil please go straight to Part 4.
Adder Information	
Grid Ref from GPS: ST	Sex: (Please tick as appropriate) Male <input type="checkbox"/> Female <input type="checkbox"/> Adult sex unknown <input type="checkbox"/> Juvenile sex unknown <input type="checkbox"/>
Distinguishing features of individual: (i.e. colour, length, markings.)	
Please indicate best description of habitat in which animal was found: (Please tick as appropriate)	
Homogenous, mature thick stand of heath:	<input type="checkbox"/>
Homogenous, immature open stand of heath:	<input type="checkbox"/>
Matrix with diverse range of heathland structure:	<input type="checkbox"/>
Woodland:	<input type="checkbox"/>
Other: (Please specify)	

Part Four – Other Reptile Sightings

Please record which other species of reptiles you sighted during your survey together with their Grid references:

Slow worms:

Grass snakes:

Common Lizards:

Please insert any further useful information here:

Once completed please return form to somersetarg@outlook.com

Or by post to:

RAGS
Binswood House
Bleadney
Wells BA5 1PF