English Nature Science

No. 27

Reptile survey methods: proceedings of a seminar held on 7 November 1995 at the Zoological Society of London's meeting rooms, Regent's Park, London

English Nature Science

No. 27

Reptile survey methods: proceedings of a seminar held on 7 November 1995 at the Zoological Society of London's meeting rooms, Regent's Park, London

Jim Foster
and
Tony Gent
(editors)

ISBN 1 85716 239 0

Monitoring slow-worms and common lizards, with special reference to refugia materials, refugia occupancy and individual identification

Anne Riddell
Durrell Institute of Conservation and Ecology, University of Kent, Canterbury CT2 7NX

Introduction

Slow-worms *Anguis fragilis* Linnaeus and common lizards *Lacerta vivipara* Jacquin are both regarded as widespread lizard species, but are known to have been declining in Britain in recent years. This study set out to discover their use of different habitats within the same Canterbury nature reserve, with the aim of pinpointing optimal habitat and identifying the most successful refugia materials, and involved devising an individual recognition system for use in the field. The study period included a sustained summer drought, which appeared to cause a slow-worm population crash.

Background

Intensive monitoring of slow-worms and common lizards took place at Canterbury Environmental Education Centre from 3 April to 30 October 1995. A further three months' monitoring will follow in March to May 1996. As a National Grid-owned nature reserve, managed as a partnership project in conjunction with Kent County Council, it is used by Kent schools but has no other authorised public access. An electricity sub-station is situated at the eastern end. Historically, it was grazing marsh, which was later gravelled in the 1930s. It stands 6 m above sea level and is screened from view by a series of man-made bunds of London clay. These vary in height but on average stand 4-6 m above ground level. Most lizards are found on or near these bunds. The reserve is bounded to the north-west by a major arterial route into Canterbury, to the south-east by the Great Stour River and on the remaining sides by light industrial development and housing.

About 25 years ago the bunds were heavily planted with trees to create a woodland screen. However, many of them have not survived, leaving small areas of light woodland and grassy slopes which have been managed for wild flowers and insects.

The lack of public disturbance made it extremely attractive for a reptile study. No previous monitoring had been carried out but grass snakes, slow-worms and common lizards had been seen occasionally.

Sites, materials and methods

Initially, in October 1994, four sites were chosen on the bunds facing the compass points, based on the most recent lizard sightings, for a preliminary survey in April 1995. These were all on managed slopes mown to encourage wild flowers. But they were quite unsuccessful and despite the closed nature of the reserve, were highly visible from the nature trails and were vandalised and disturbed.

Well-hidden sites with the new criteria of assessing reptile use of less intensively managed, different habitats were then chosen on more secluded parts of the bunds and this data covers these sites from 1 May to 19 October - the last sightings for 1995.

Site A, facing north-west, was part of the surviving woodland and the tree cover and aspect of the site meant it was the coolest of the three. On the opposite side of the same bund and only 2 m away over the crown was Site B, a south-easterly flower meadow of mainly ox-eye daisy grading into grassland, with woodland at the crown of the slope and common reed beds at its foot. This was the most sheltered and varied of the three sites. The most open and warmest was Site C, 160 m away, a rough grassland slope, also facing south-east, which was subject to minimal management to reduce Hawthorn colonisation.

In the absence of a standard reptile survey method, techniques were devised as required. A survey site 10 m x 15 m was marked out on each of the three chosen habitats and a variety of materials placed upon it to attract reptiles (11 refuges per site), sampling approximately 4.5% of each site (Figure 1a, b and c). With an extremely limited budget and the proximity of a scrap metal dealer's, travellers' caravan site and housing estate on the reserve boundaries, tins were not considered a viable proposition. Therefore a variety of materials were used in an experiment to identify successful survey refugia - including tins - but also corrugated asbestos, carpet, roofing felt, hardboard and logs. The refuges (at least two of each material per site) were not placed randomly but strategically, with reference to the target reptiles' behaviour, as the purpose was to obtain maximum encounters. Accordingly, they were placed to offer a range of sunshine and shade conditions at different times of the day and of the year and to make the maximum use of the open areas and topography. The choice of which material was placed on a 'hot spot' was random.

The sites were visited on average three to four days a week (up to six in May and June - the peak period) and if sightings were high then each site would be visited up to three times in one day to record maximum encounters. To preserve the vegetation on these small survey sites, a track was walked between refuges and the habitat in sequence between scanned for reptiles. These were caught by hand, weighed, measured and released. Good fieldcraft skills were required to monitor the whole of each site and not just the refugia.

Identification

For the purposes of this study (to consider population size, growth, dispersal and home ranges), it was essential to identify individuals in the field and initially a marking scheme was attempted. But slow-worms proved a challenge. Tippex, nail varnish and permanent marker were all tried and rejected. Field trials of the first two in May gave less than 24 hours' recognisable marks and a trial in an outdoor reptiliary with captive slow-worms in less abrasive grassy conditions gave only 48 hours. The permanent marker was better but was dependent on finding the same individual at regular intervals - a trial of captive juveniles produced a maximum of 12 days' markings in one juvenile, but others had to be re-marked one, two or three times during that period, especially in the days immediately after sloughing when the skin seemed exceptionally absorbant and the marks faded rapidly. Juveniles were the greatest problem to identify as they were so similar in size and appearance.

Other marking materials such as enamel paints were rejected on the grounds of potential toxicity or visibility to predators. Toe clipping of common lizards was excluded as unacceptable interference. The use of pit tags was inappropriate for either species on the grounds of scale design and body size and it appeared an intimate knowledge of individuals based on each's characteristics was required.

Slow-worm chin spots were rejected as too complicated a pattern to memorise in the field if dealing with large numbers of animals. Also the chin markings fade dramatically as the slow-worm prepares to slough.

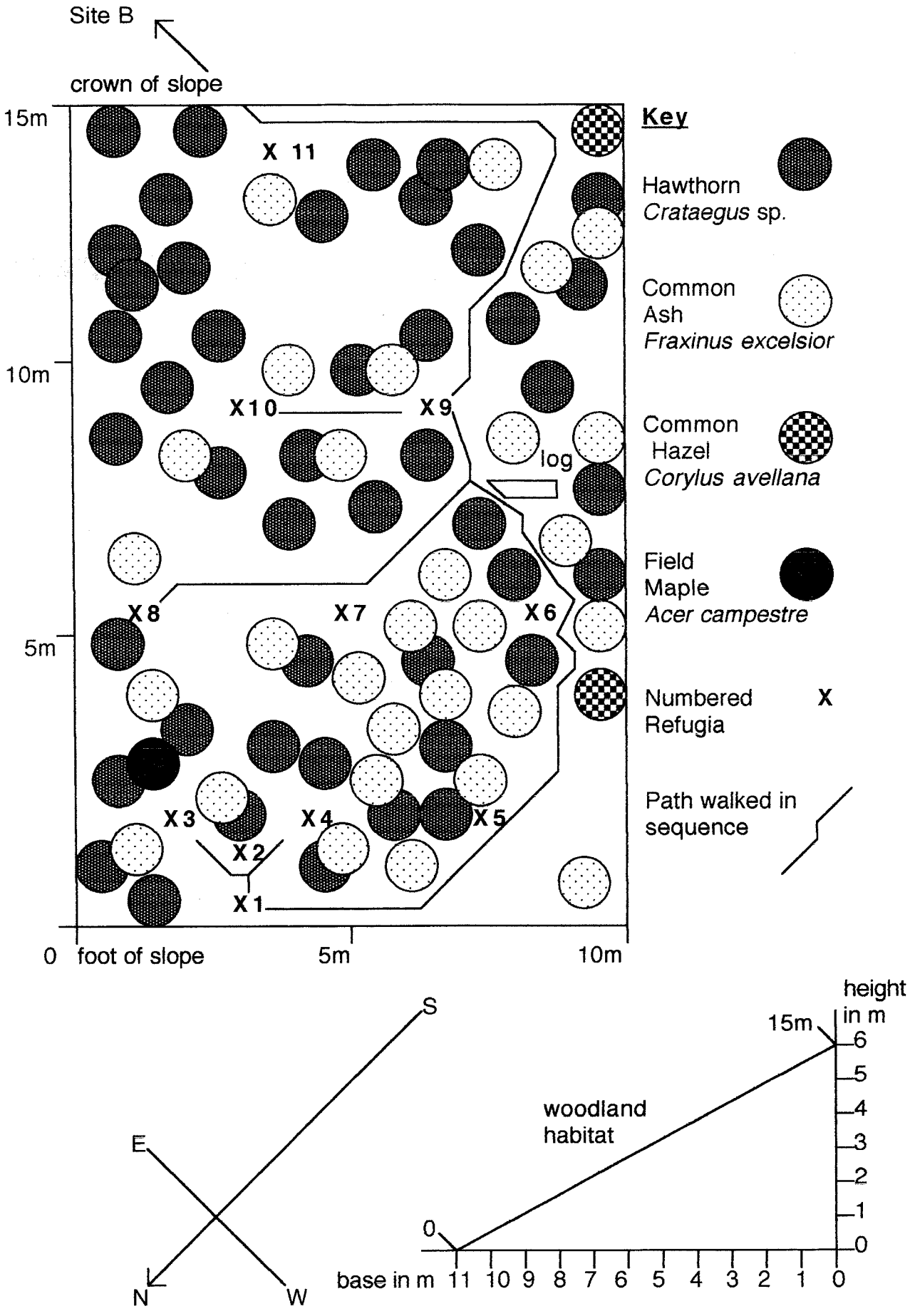


Figure 1a. Site A - woodland habitat

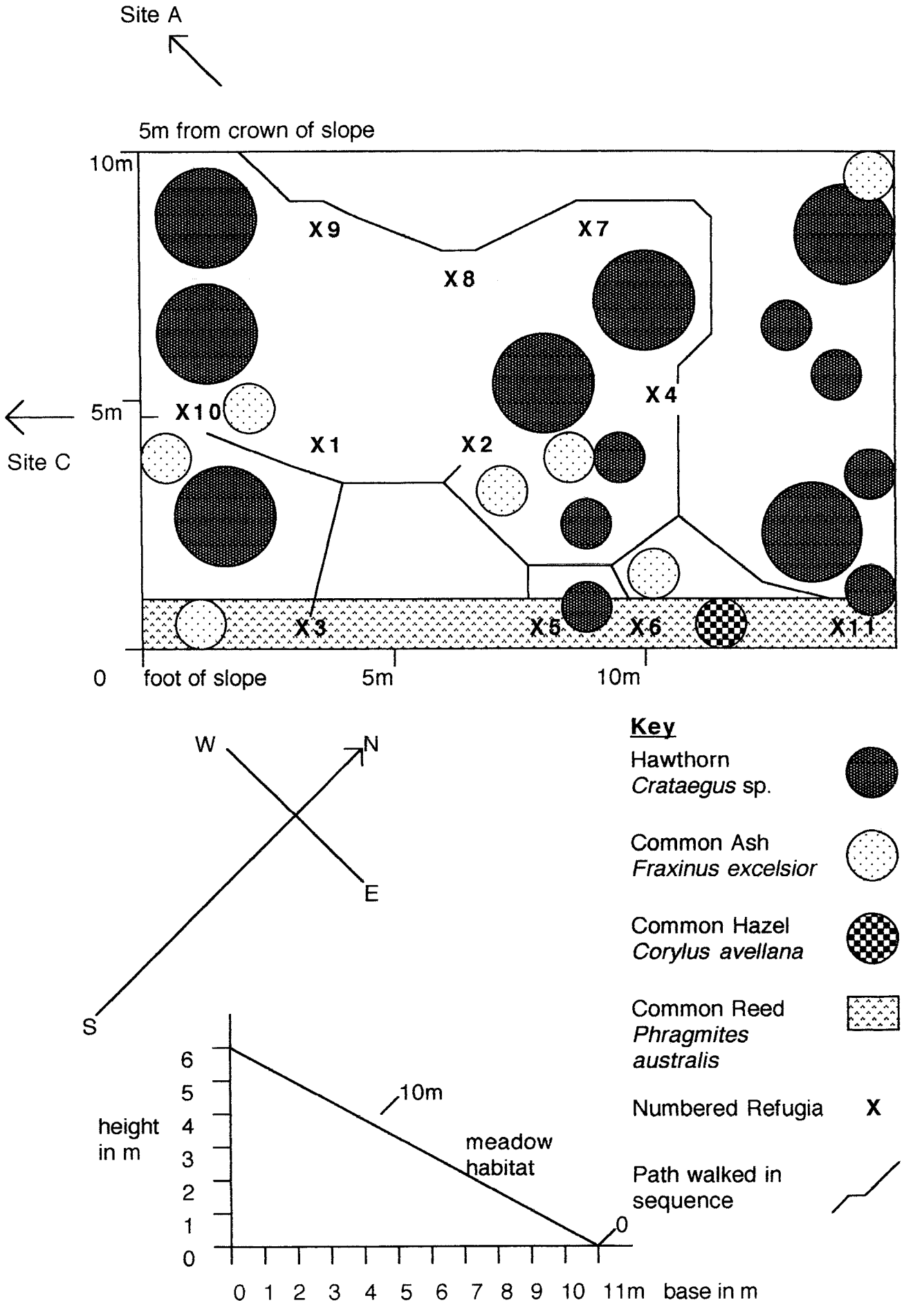


Figure 1b. Site B - Flower meadow

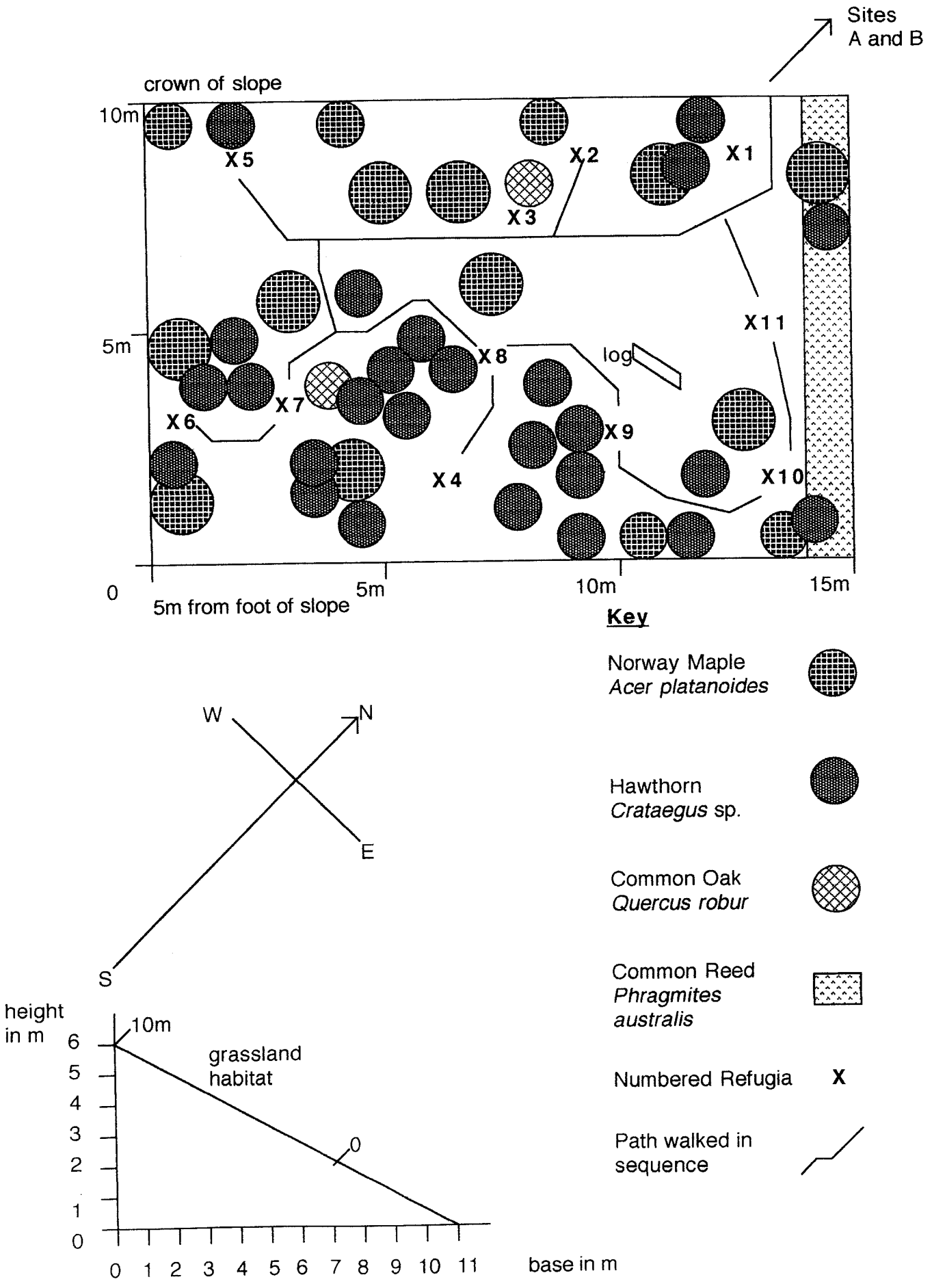


Figure 1c. Site C - rough grassland

However, the head markings (Figure 2 - AF is *Anguis fragilis*; LV where it appears later is *Lacerta vivipara*) proved easy to recognise and an identification system using this technique, which may not have been attempted previously for this species but have proved successful in adders *Vipera berus* and smooth snakes *Coronella austriaca*, was devised.

The vertebral stripe ends on the head in different patterns which appear to be individual to each reptile. There are similarities of shape - generally a pincer-style design with a dark dot between the two forks and often a separate patterning towards the snout - but they are dissimilar enough to identify individuals on successive occasions. These patterns were drawn in a field notebook, as well as photographed. In addition, details of each slow-worm's measurements, tail condition, colour, scarring and any other clues to its identity were noted.

Even in males this head pattern is retained when the juvenile stripe has gone. As the season progressed, the head marks alone proved to be sufficient, leading to 105 identifiable individuals in the survey. Patterns were also seen in hatchlings. Further work would be required to find if these marks change with age. A successful individual field identification technique would assist greatly in learning more about this secretive reptile's behaviour.

Common lizard males were identified by the pattern on their anal scale (Figure 3) which was extremely distinctive. Females were not always so obliging. A large number did have spotting on this scale, but occasionally the belly pattern had to be used instead. Hatchlings were unidentifiable initially but by September belly spots were showing. Preliminary patterns were taken in an attempt to match them to individuals the following spring. By the end of the first season there were 30 identifiable adults and subadults in the study.

With a well-equipped Kent County Council field studies centre on site, its technology was tested to record individual markings. A hand-held scanner which produced a digital image to be stored on a computer database seems an exciting prospect for identification records in the future. A further development has been the use of a Canon ion digitising camera for image storage on computer.

Results

Out of 202 slow-worm encounters, 178 or 88.2% of animals seen were caught and identified. More reliance could be placed on slow-worm data than that for lizards - where only 23.9% were caught from 155 encounters.

The overall slow-worm population structure on the reserve was as expected with smaller numbers of adults and larger numbers of young. But the population structure per site was variable, with only small numbers of juveniles on the wooded and flower slopes while Site C, the unmanaged grassland, had large numbers. This habitat provided far more ground cover for both juveniles and their invertebrate prey in spring and early summer. However, the largest number of adults and subadults were found on the flower slope with its mosaic of microhabitats, indicating the importance of the interfaces between habitats to this species. Seasonal migration between the woodland and flower meadow was observed.

Turning to the slow-worm encounter rate (Figure 4), the large percentage of juveniles on the grassland was reflected in the encounter rate for that site in May, although it tailed off dramatically during the year. The second of the two charts shows how many of those encounters were with identifiable individuals. Encounter levels were high in early summer, then declined steeply as temperatures rose during July. There were no sightings at all from 19 July until 6 September, and few encounters in September and October, leading to concerns about the population's survival.

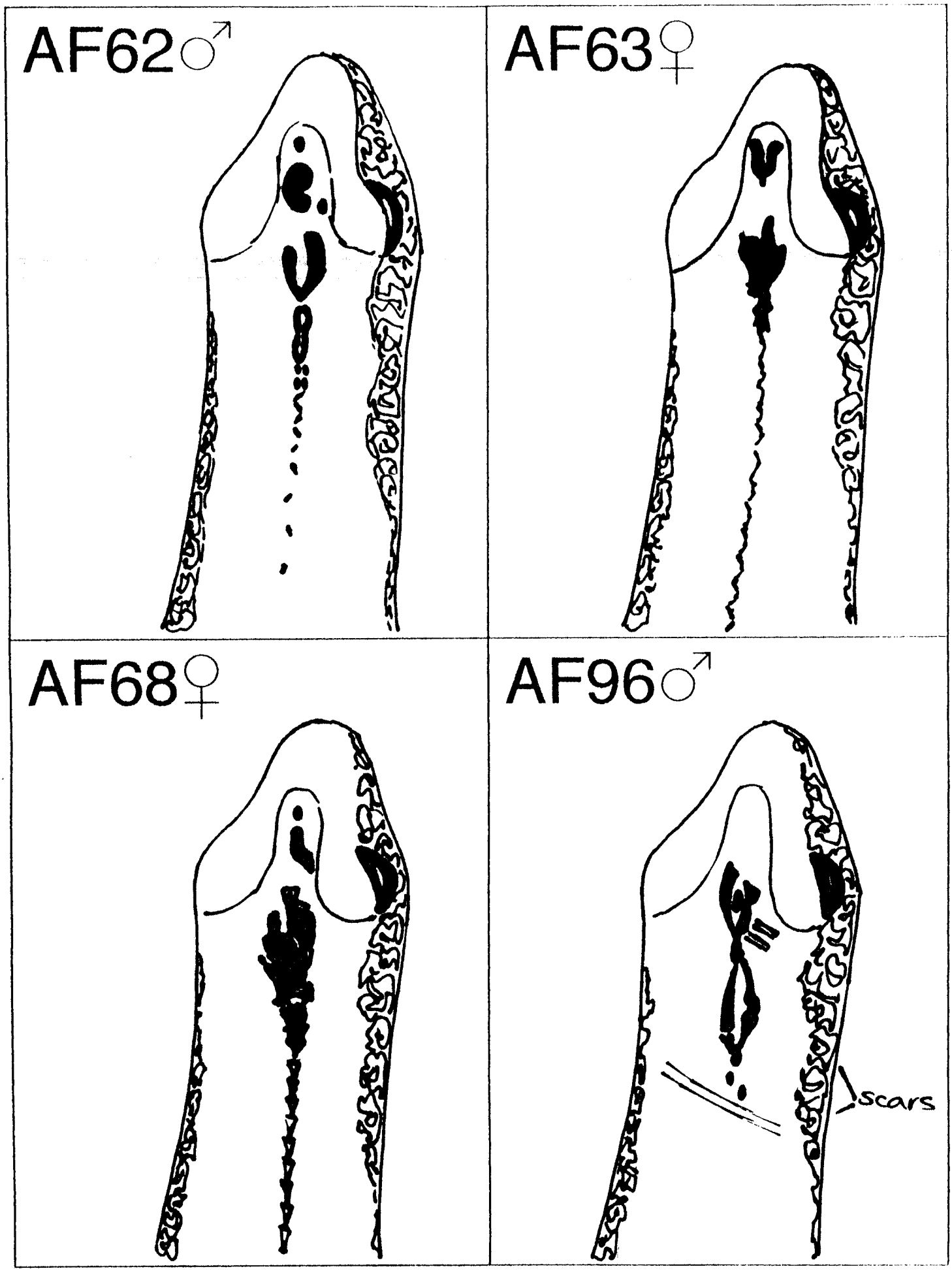


Figure 2. Identification of individual slow-worms

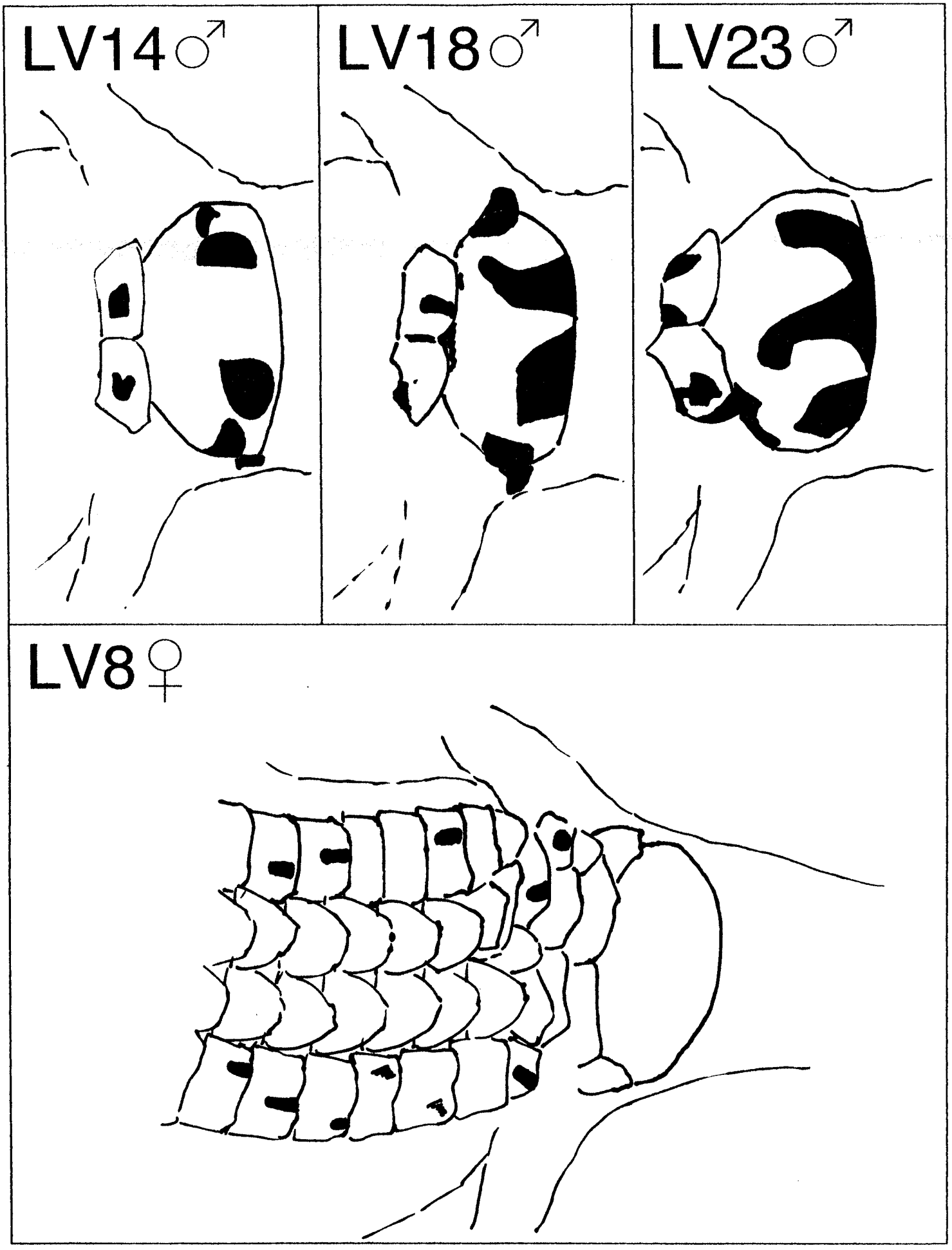
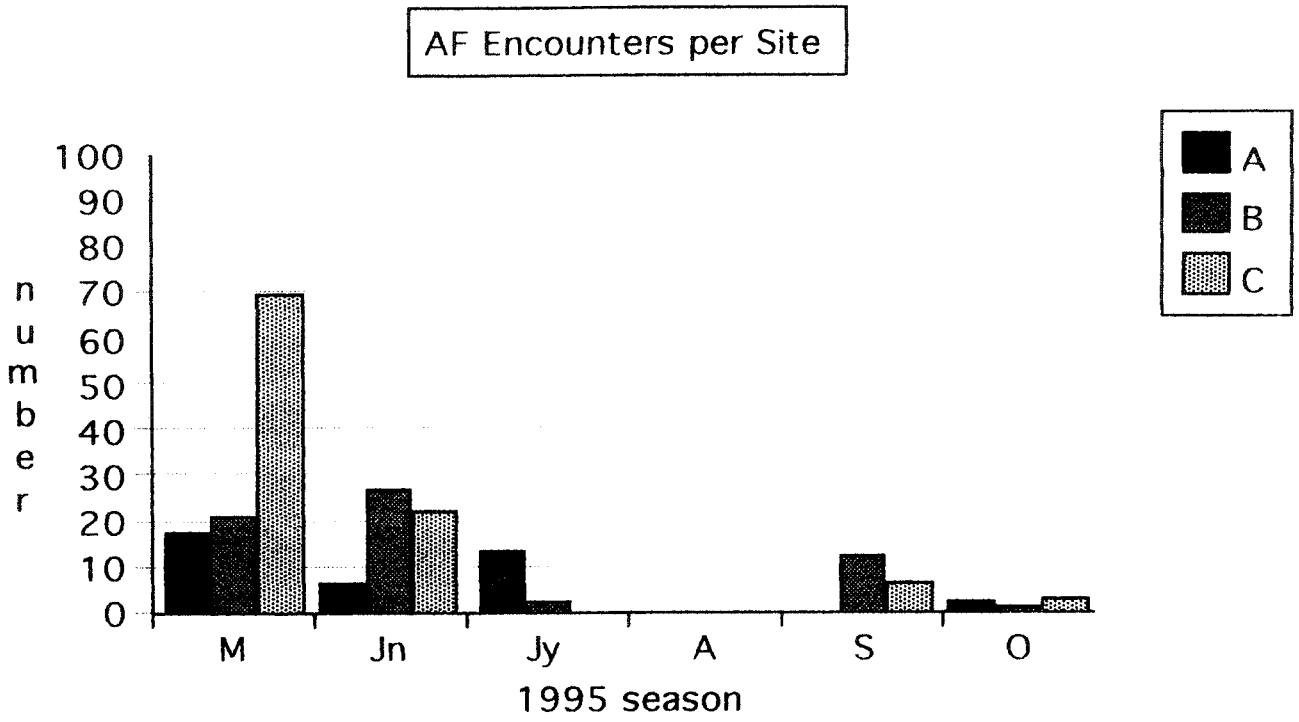


Figure 3. Identification of individual common lizards



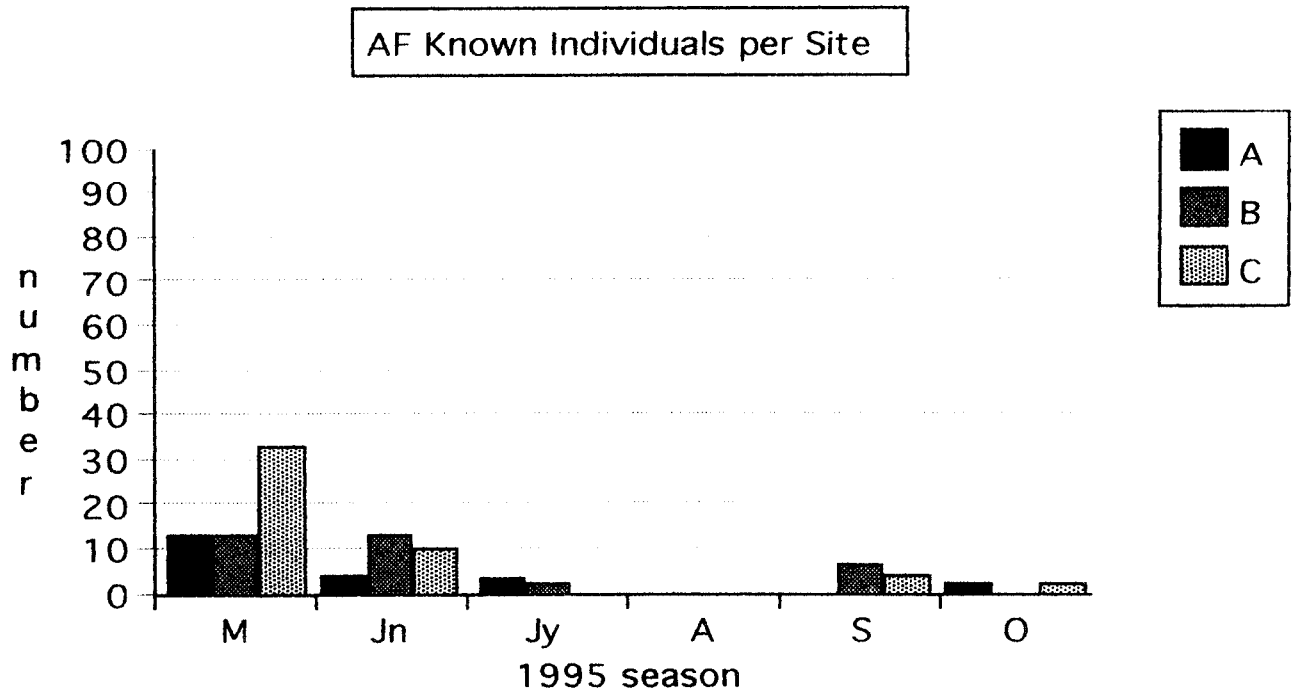


Figure 4. Encounters of, and use of sites by, slow-worms 1995 season: 1 May-19 October

The common lizard population, in contrast, consisted mainly of adults. Very few subadults and no 1994 juveniles were found during the 1995 season. Again, the rough grassland was by far the best for lizard encounters - 45 here during May compared with just one on the flower slope. Encounter rates on Site B remained in single figures throughout the year and lizards were seen in the wood only on very hot days in July.

The vast majority of identified individual slow-worms were found just once but those that were found repeatedly were usually associated with a time of change, such as sloughing, going into or coming out of aestivation/hibernation over a two or three week period. Once the change was complete, they were not seen again. Lizards were quite different and known individuals caught several times were often under different refuges but always on the same site.

The times and temperatures at which slow-worms were encountered (Figure 5) varied during the year. The first part of the morning was the most successful - from 10-11 am in May and June - but there seemed to be a 'second sitting' from 1-3 pm.

On the temperature front, slow-worms were seen above ground between 8° and 22°C but 11-17°C seemed to be the preferred window.

Lizards operated at generally higher temperatures - 11-24°C on average with very few encounters below 10°C - with a morning peak of activity in May between 9 and 10 am. Although there were few time periods in the day when no lizards were found, in September and October there were again two 'sittings', mid-morning and early afternoon.

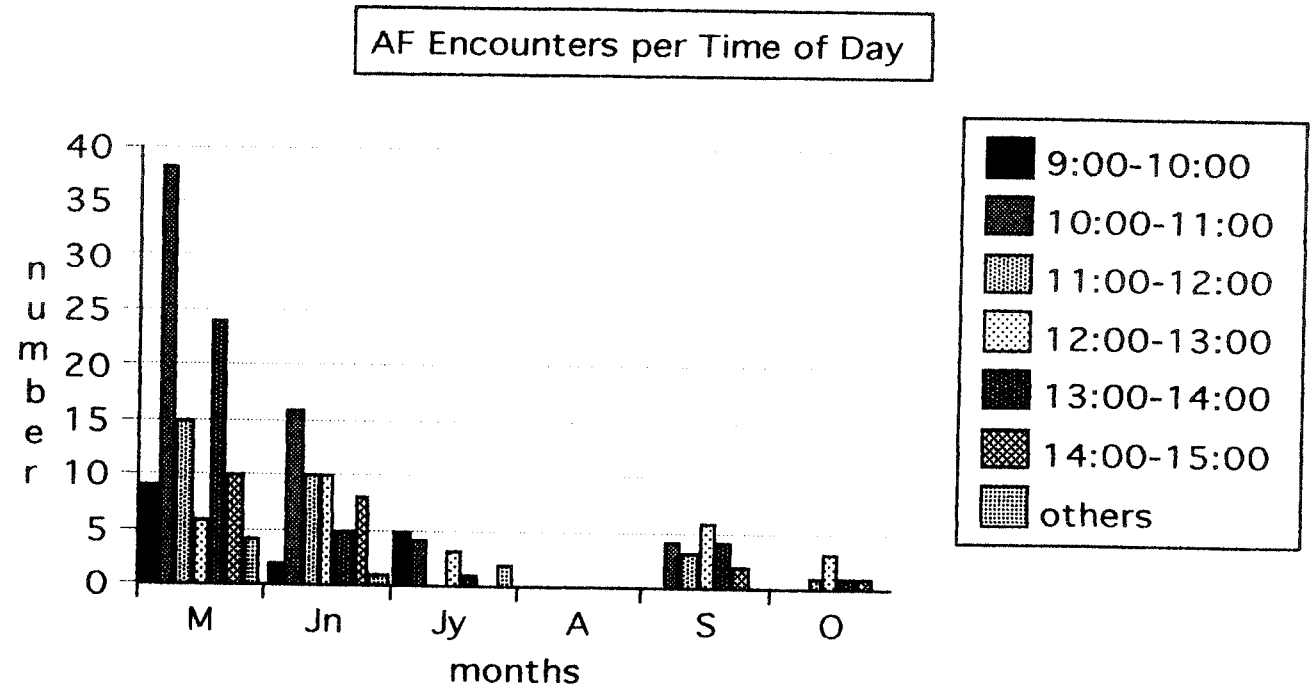
Refugia

The 1995 season's hot weather made temperatures under tins in mid-summer soar to over 50°C and still in the low 40s at 7 pm. While tin certainly attracted slow-worms in May and early June, in this exceptional summer it quickly became too hot for them and was outstripped in encounter rates by roofing felt throughout the year, with corrugated asbestos and carpet also scoring highly (Figure 6). Hardboard was also reasonably successful and all of these materials warmed up more slowly and retained their heat longer than tin. Temperatures beneath these refuges, even in high summer, were nothing like as extreme as those under tins, varying perhaps 2-8° higher than the soil beside the refuge, compared with perhaps 25° higher under a tin.

Lizards too preferred roofing felt as both a basking site and a refuge, although the high number of lizard encounters in the grass around the refuges indicated their alertness to intrusion.

Drought

Slow-worm encounters following one of the hottest and driest summers on record (many August days were more than 5°C above normal with a local maximum of 31.5°C and no significant rain between 14 June and 2 September) were depressing (Figure 7). They dropped as anticipated during the hot weather but numbers were expected to rally in September and early October, boosted by the year's hatchlings. This did not happen. Only 14 slow-worms were found from the end of the drought to the final sighting of the year (2 September-19 October) and only five of those were hatchlings. Most of the survivors were on the flower slope. Lizards, on the other hand, appeared to recover well.



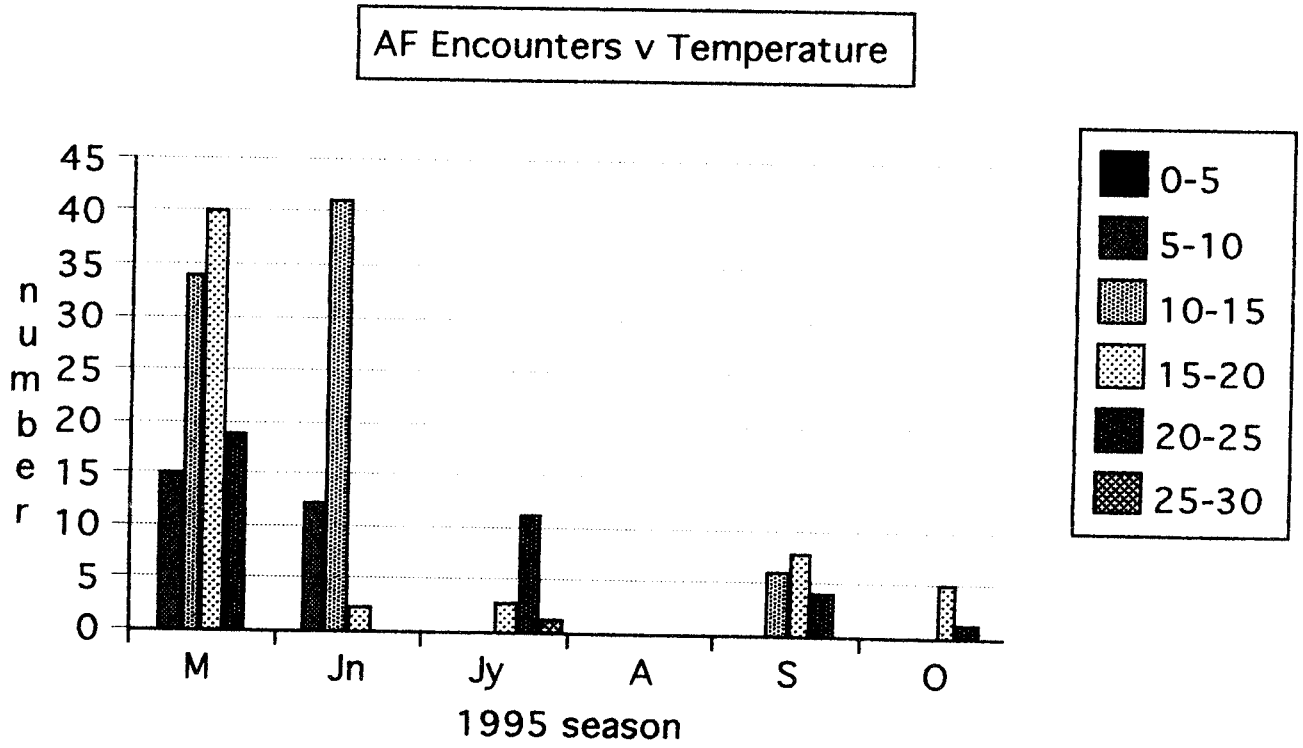
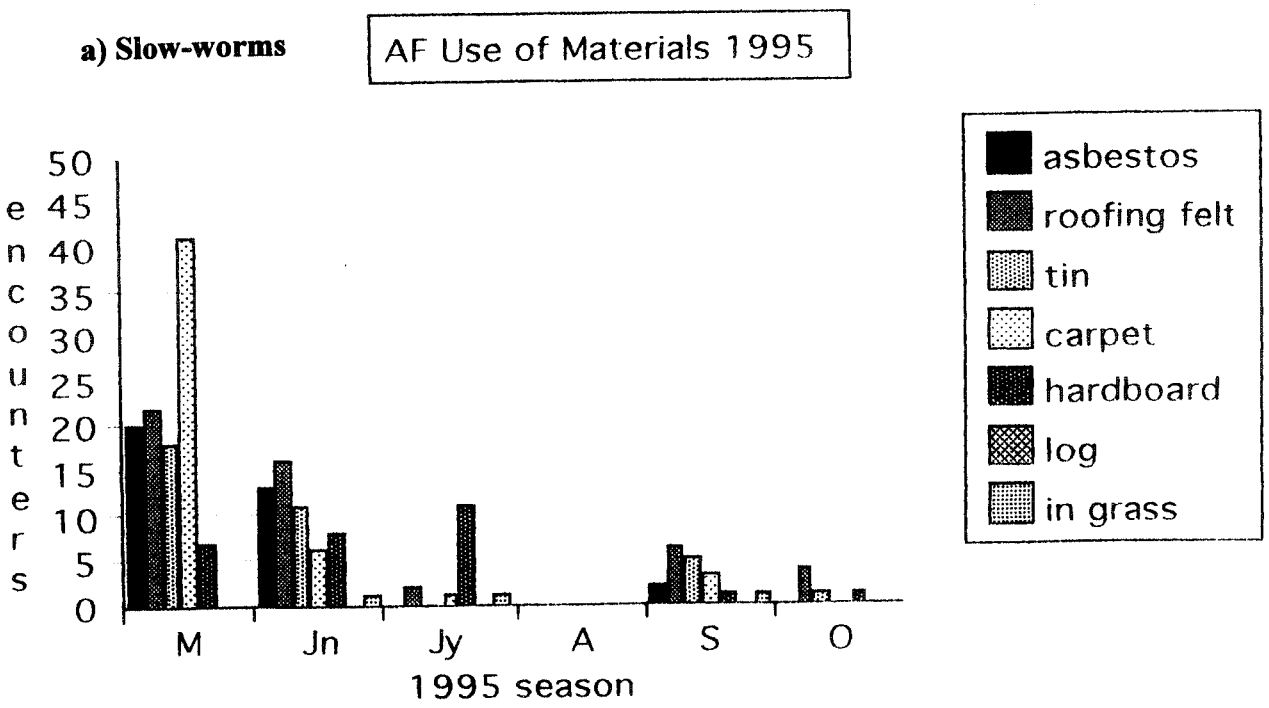


Figure 5. Encounters of slow-worms - time of day and temperature, 1995 season: 1 May-19 October



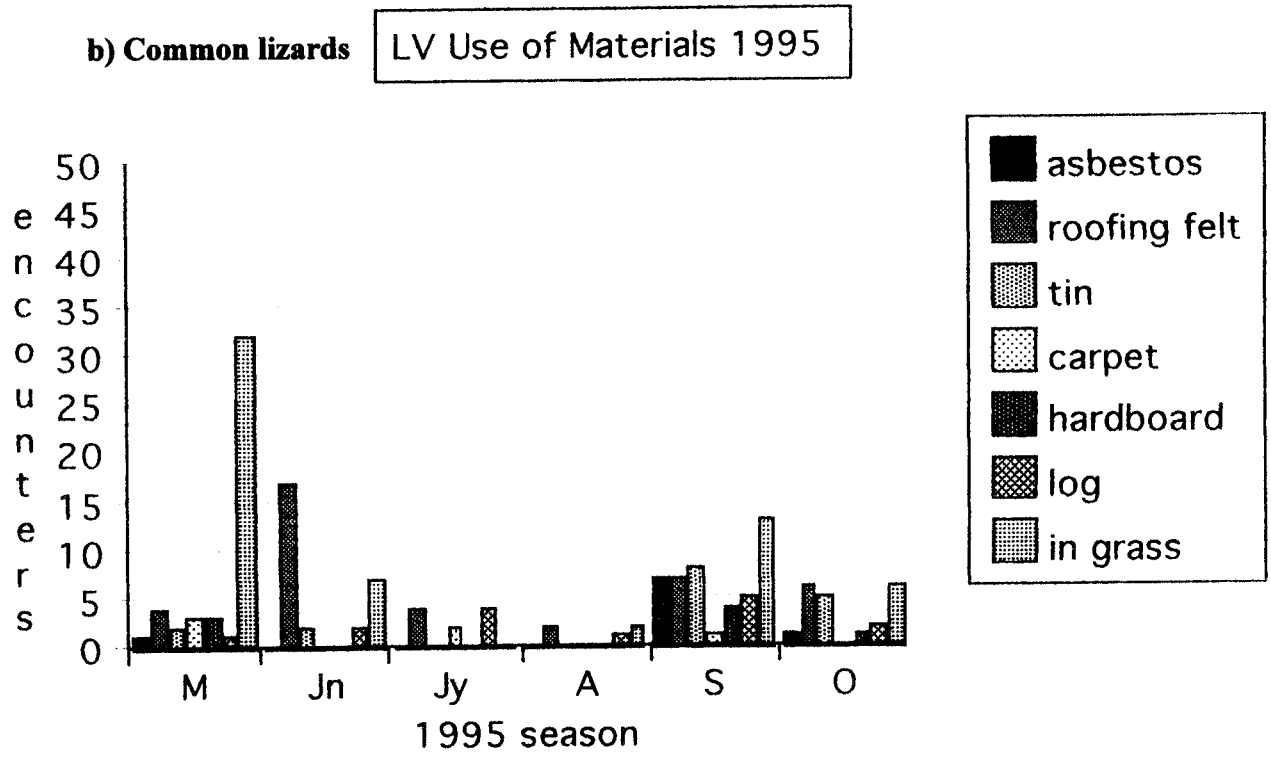


Figure 6. Refugia - use of materials by slow-worms and common lizards, 1995 season: 1 May-19 October

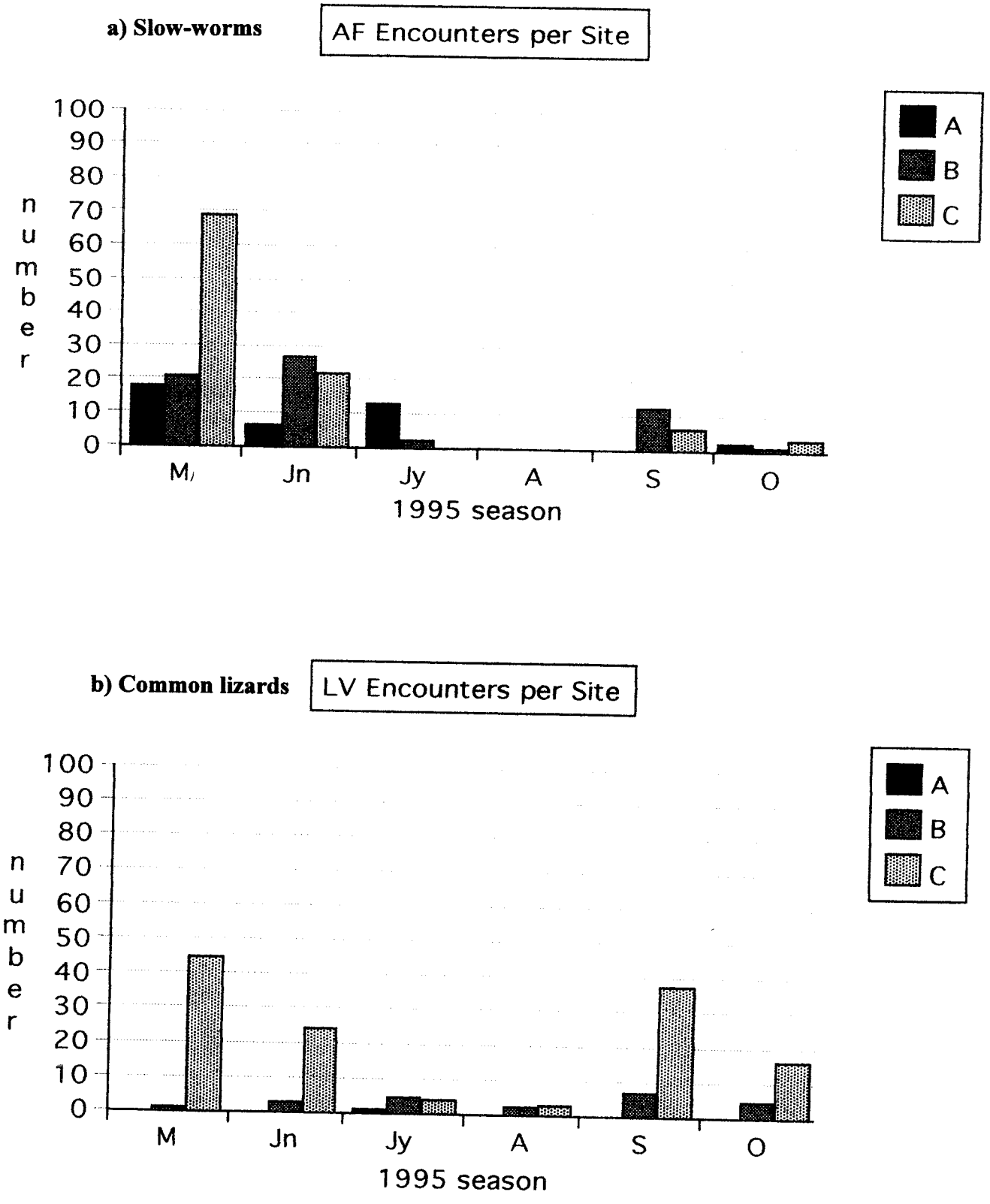


Figure 7. Encounters of slow-worms and common lizards, 1995 season: 1 May-19 October

One of the autumn slow-worms was a female last caught in June 1995, and was the only one to have been caught previously. Despite the intervening 12 weeks, she showed no growth or weight gain and was in extremely poor condition. Others bore old injuries which had not healed, had breathing difficulties or were also in poor condition. One, caught at 12:30 on 19 October, a sunny day of nearly 20°C, bore all the signs of having just emerged from a long period underground. Although the refuge - roofing felt - had been in the full sun for several hours and was dry and warm (16°C underneath the felt) the slow-worm was wasted and covered in condensation, extremely lethargic and had that sickly, shrunken look of slow-worms newly emerged in spring.

Concerns that the slow-worm population on this reserve crashed as a result of the extended drought and exceptional aestivation period cannot be confirmed until further monitoring takes place during the 1996 season. The following possibilities were considered:

- Had the slow-worms moved off the slopes until conditions improved? The reserve was searched but no more animals were found.

- Did predation suddenly increase? Most known bird and mammal predators occur on the reserve, but fox dropping analysis revealed no recognisable reptile predation.

- Was starvation a factor? Soft-bodied invertebrate prey disappeared for several weeks.

- Had they slipped from aestivation to hibernation? September's rain rapidly gave way to unseasonably cold temperatures and night frosts, despite the later Indian summer. Even then, no reptiles were seen.

- Was the period of aestivation too long and only those with greater reserves survived? No 1994 juveniles were found in autumn 1995, and the majority of encounters were with adult females. Were they perhaps pregnant but reabsorbed their young and survived that way?

- Had the population peaked? What this a cyclical crash?

Or was it possible that on this particular artificial site, where the clay was compressed when it was brought by lorry and tipped on to the land to form the bunds, there is a direct association between the compacted clay drying out through the long hot summer of 1995 and the small re-emergence rate the following autumn? If a JCB was taken to the bunds, would the slow-worms be revealed, shrivelled and dessicated in the clay?

Conclusion

Preliminary findings indicate that rough grassland plays an essential role in providing shelter and invertebrate prey for both lizard species in spring and early summer before vegetation has grown up. It remains the optimal habitat for the more philopatric common lizards. However, slow-worms appear to require a greater mosaic of microhabitats. Both species make use of a variety of refugia but roofing felt and other materials which heat up more slowly and retain their heat longer appear to be more successful survey methods than traditional tinning for reptiles.

The long summer drought of 1995 may have been catastrophic for slow-worms, at least on this reserve where they inhabit man-made London bunds. Dessication cannot be proved. But while the largely terrestrial common lizard with its broader diet appeared to rally after the hot, dry summer, the stark decline in autumn encounters for the fossorial slow-worm,

dependent on soft-bodied prey, is difficult to explain if the drought was not a factor. This will not be resolved until intensive monitoring resumes in spring 1996.