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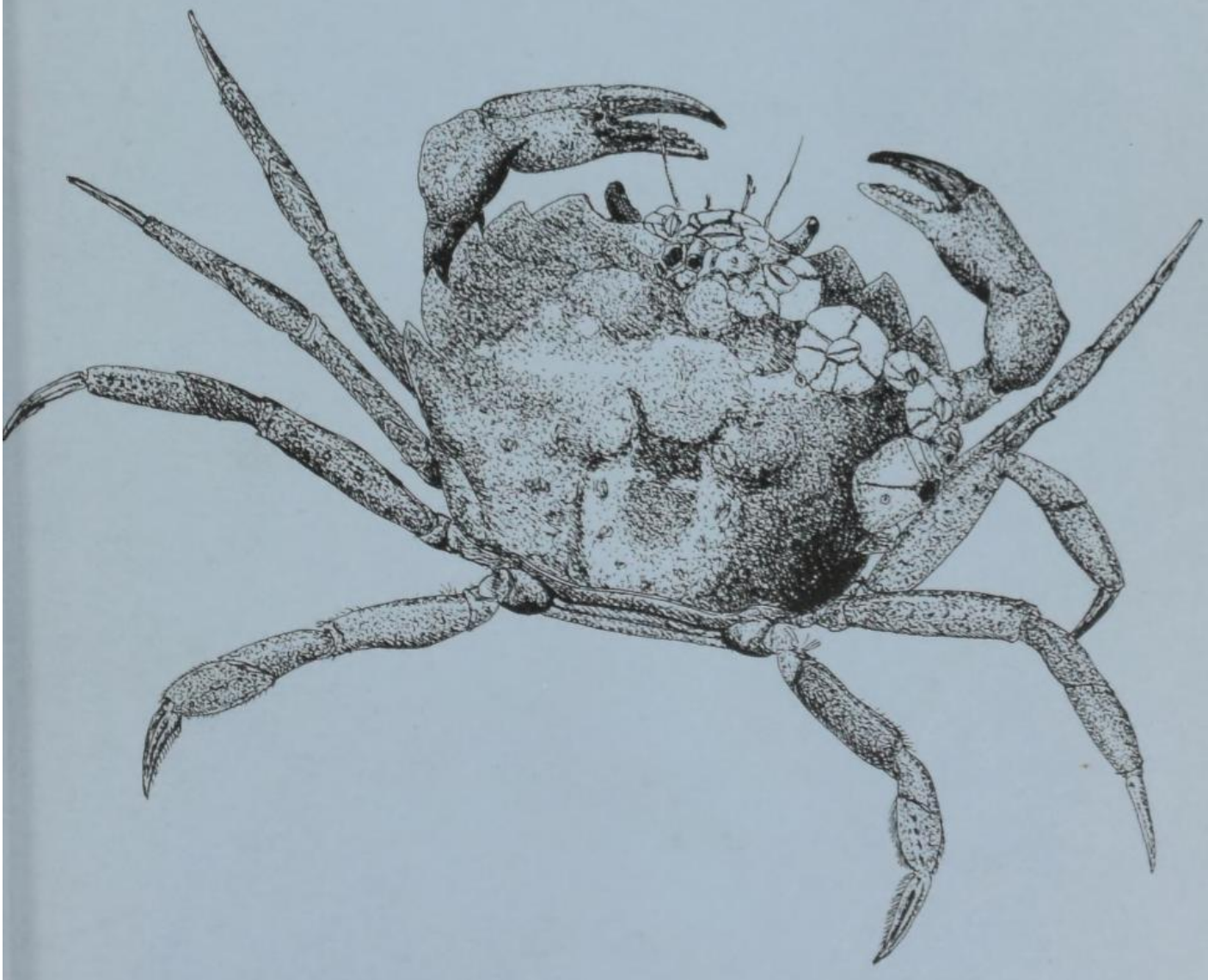

THE DISTRIBUTION AND STATUS OF LIZARDS IN NORFOLK

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Introduction

Three lizards are native to England but one of these, the sand lizard *Lacerta agilis* (Linn.), is not found in Norfolk (Buckley, 1975). It is now confined to lowland heaths in the south of the country and sand dunes in Lancashire. The common lizard *Lacerta vivipara* (Jacquin) and the slow worm *Anguis fragilis* (Linn.) are well within their geographical range in Norfolk and found throughout the county.

The maps presented in this paper show the distribution of Norfolk's lizards on a tetrad basis for the first time and it is hoped that they will act as a stimulus for further recording. The paper also provides information for interested persons to be able to find and identify lizards within the county.

Identification and habits

The lizards show more diversity of form than any of the other groups of reptile. They can be readily distinguished from snakes only by their moveable eyelids, external ear openings, notched, not deeply forked tongues, and lower jaws which are firmly fixed. Lizards also lack the broad ventral scales characteristic of most snakes.

The common lizard and slow worm belong to different families and look very different. The common lizard is a fairly typical member of the Lacertidae having a comparatively short body, distinct head and long tail (Fig. 1). The limbs are well developed and project more or less sideways from the body as far as the elbows and knees. Five digits with claws are found on each limb. The slow worm, a member of the Anguidae, shows the body form typical of the family. It has a long body and fairly long tail. Neither the head nor the tail are distinctly set off from the body nor are there visible traces of limbs (Fig. 2). Having a snake-like form, its method of locomotion is similar to that used by most snakes.

Both the slow worm and the common lizard have the ability to shed their tail voluntarily when this is seized by a predator. This self-fracture or autotomy is brought about by the sudden contraction of muscles which split a vertebra at a special plane of weakness. Normally the tail fractures at the point at which it is seized. The autotomised tail flexes back and forth vigorously for several minutes to distract the predator whilst the lizard is able to escape. The vertebrae at the base of the tail lack the special plane of weakness and this part cannot be autotomised.

After fracture a new tail end is formed in the course of a few months. The regenerated section is not the same as the original. A rod of cartilage replaces the original vertebrae and it does not grow to the full length. The scales are less pigmented on the new section of tail and the original pattern is not continued onto it. It is always possible to recognise a regenerated tail unless it was shed when the lizard was very young. The slow worm's ability to regenerate its tail is less than that of the common lizard and a short blunt tail results.

Both species are ovoviviparous which means that the female retains the eggs inside her body until they are due to hatch. Pregnant females spend much of their time basking, and the eggs develop more rapidly than they would if buried in the ground. Upon being laid the young lizard soon breaks free of the membranous egg shell. In general ovoviviparous species have been able to extend their range farther north than oviparous (egg laying) species.

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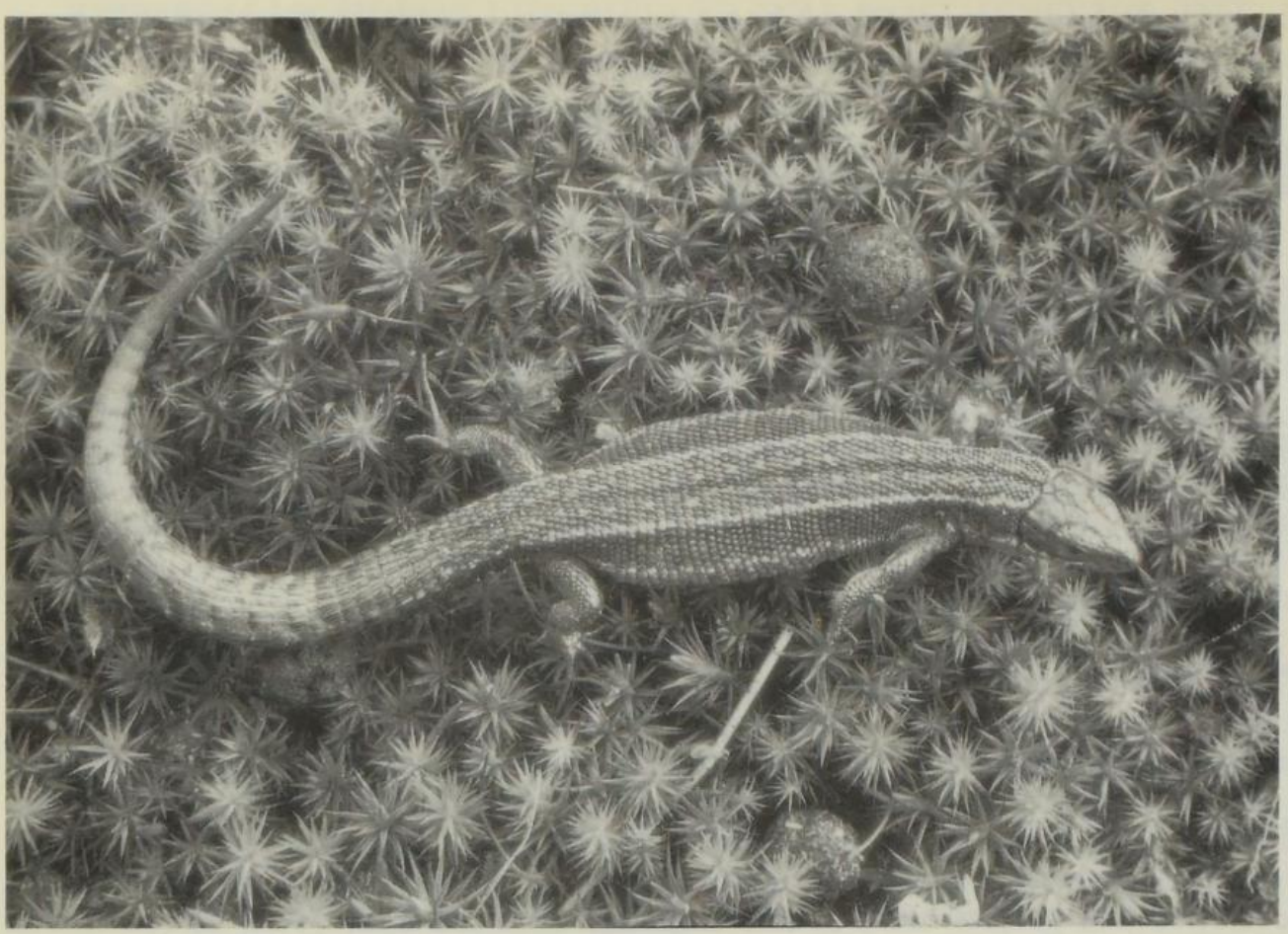

Fig. 1 Common lizard female. Cranford Heath, Dorset.

Lizards, like snakes, shed the outer layer of their skin several times a year and it is relatively easy to identify a slough. In the common lizard the skin is shed in pieces sometimes as large as to include the whole body except for the head, limbs and tail. Skin from the dorsal part of the body can be recognised by the pattern of light and dark markings which have the same distribution as on the animal but are less distinct. Portions of the belly slough can be recognised by the rectangular appearance of the scales.

The slow worm casts its skin rather like a snake but rarely does the slough come away in one piece. As the slow worm moves forward, the skin normally concertinas to form thick rings which are characteristic of this species. Fragments of slough, and these rings, if gently pulled apart, reveal the almost uniform shape and size of the slow worm's scales over the entire body.

The sloughs of common lizard may be found towards the base of heather stems in suitable habitat and beneath pieces of fallen wood, bark and rubbish. Slow worm sloughs are found in the base of dense vegetation, in the surface peat and under natural and discarded objects such as wood, plastic, scrap metal or fabric.

The common lizard may reach a length of about 180 mm (7 inches) but most specimens are shorter, about 140 mm (5 inches). The ground colour of the dorsal surface is variable. Adults may be brown, yellowish, reddish, greyish or greenish. Darker and lighter markings are longitudinally arranged. There is usually a dark vertebral stripe, more or less entire, extending from the back of the head to the base of the tail, and a broad dark lateral band on each side of it extending the whole

length of the body. These are edged above and below with yellowish or whitish lines, which are continued in a series of light spots along each side of the tail. The narrow light lines between the vertebral and lateral stripes may be uniform in colour or flecked. In the male the pattern of darker markings is less distinct than in females. The two sexes differ in belly coloration. That of the male is orange or vermillion thickly spotted with black. The female has a pale orange, yellowish or whitish underside with a few spots or none at all. Males can be identified without handling by the swollen base of their tail where the penes are located. The ground colour of the young is black, blackish bronze or dark brown with the adult markings faintly discernable as a golden or dirty yellowish outline.

The general biology of this lizard is described in Smith (1951), Simms (1970), Street (1979) and Frazer (1983). It occupies a wide variety of habitats in Britain being found on commons, moorland, heaths, meadows, boglands, hedgerows, grassy banks, the borders of woods, forest clearings and sunny glades. It does not avoid damp habitats. In coastal regions it inhabits sand dunes and rocky or chalk cliffs. It is found beside country paths and roads, beside old walls and fences, on railway embankments, and stone quarries and in rubbish dumps. Unlike some lizards found on mainland Europe it does not penetrate far into villages and towns (Street, 1979).

It has a preferred body temperature of about 30°C and basks to achieve this temperature. During springtime, basking individuals may readily be seen on a favourite sun trap with their bodies flattened and tilted towards the sun. A log, stone or base of a tree, a pile of brushwood, or a clearing amidst thick vegetation may provide a suitable basking site. When disturbed the lizard makes off into the undergrowth in a series of abrupt dashes and brief pauses. When the danger appears to have passed, it returns to its original basking spot or one nearby.

Mating takes place in April or May and the young are born between late June and early September, but usually at the end of July. The usual number of young is 5 to 8 and rarely up to 15. In one study of 50 females, the mean clutch size was 7.7, range 3-11 (Avery, 1975). The length at birth is about 40 mm. At the beginning of autumn the common lizards retreat into suitable holes in the ground and crevices amid the roots of vegetation to hibernate. Table 1 suggests an active period from early/mid April to late September early October in most years. Warm weather during the winter may tempt out some individuals and bring forward the date of emergence.

Table 1 The number of sightings of lizards per month (data from all years 1970-1987).

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Common lizard	0	0	2	40	25	28	41	58	19	6	0	0
Slow worm	0	0	0	14	16	14	15	14	7	2	0	0

The slow worm may reach a length of about 500 mm (20 inches), but it is usually less. The tail when complete is slightly longer than the head and body together. Smith (1985) found that autotomy had occurred in 50% of adults and 20% of juveniles at his study sites and therefore snout to vent length is probably a more useful measurement for comparing the size of individuals than total length.

When adult, the two sexes are readily distinguishable from one another by colour and pattern. The dorsal colour of males is grey, lead grey, grey brown, light brown, dark brown, brick red, copper or bronze. The sides are similar to the top

Fig. 2 Slow worm female. New Forest, Hants.

of the back and the underside is thickly mottled dark grey on a lighter background. The vertebral stripe, present in the young, usually fades in the adult and may be absent especially on the tail.

Females are usually light or dark brown, brick red, copper or tan on top. The dark vertebral stripe is often, though not always retained. The sides are very dark brown or black becoming lighter towards the belly and head. The underside is black.

Newly born slow worms are pale golden brown, light yellow, cream, sometimes copper or silvery grey above with black sides and a black underside. There is a black V or dot on the back of the head which continues as a thin vertebral stripe to the tip of the tail (Fig. 3).

Some specimens, usually males, develop blue spots which vary in size and abundance in different individuals. They range in size from tiny flecks to the size of a whole scale and in colour from pale to dark blue. Their distribution is more or less irregular on the top of the back particularly on the anterior part.

The general biology of this lizard is described in Smith (1951), Simms (1970), Street (1979 and Frazer (1983). Useful data are also provided by Smith (1985). In Britain the slow worm occupies a variety of habitats. It is found on commons, meadows, heathland, hedgerows, the edges of woods and in sunny glades, and on railway embankments. Often it occurs in areas associated with human activity such as sand and stone quarries, chalk pits, rubbish tips, disused farmland, gardens, churchyards and cemeteries.

The slow worm is not usually found basking except in the early morning and in the spring; more often it lies under an object such as a flat stone, log, piece of

Fig. 3 Recently born slow worm. New Forest, Hants.

bark, pile of rock, or discarded piece of sheet metal, to warm up. In late summer however pregnant females are often to be found lying out in the sunshine. Individuals may also be found roaming about in the early evening. Slow worms like to burrow in light soil and may be spotted almost totally concealed amongst material at the base of vegetation. Smith (1985) recorded an average body temperature of 26°C in the period June to August, slightly lower than values obtained for the common lizard. Table 1 suggests an active period from April to early October in Norfolk.

Mating takes place in April, May or early June and the young are born between the end of August and mid-September depending upon the quality of the summer. Smith (1985) gives an average litter size of 8.2 (range 1-18). The average head and body length at birth is about 45 mm. Male slow worms reach maturity in their third or fourth year and females a year or so later.

Slow worms hibernate in the second half of October depending to some extent upon the weather. They select crevices in banks and amongst the roots of bushes and hedgerows, under piles of leaves or wood, under heaps of stone or rubble, or they may make their own hole. They may hibernate singly or in groups. In the springtime the males and juveniles appear before the females.

Recent records and distribution

Records sent to the society by members and others since 1960 have been copied onto edge notched cards for ease of storage and retrieval. Post 1970 records have been plotted as tetrad (2 km x 2 km square) maps. There has been no systematic

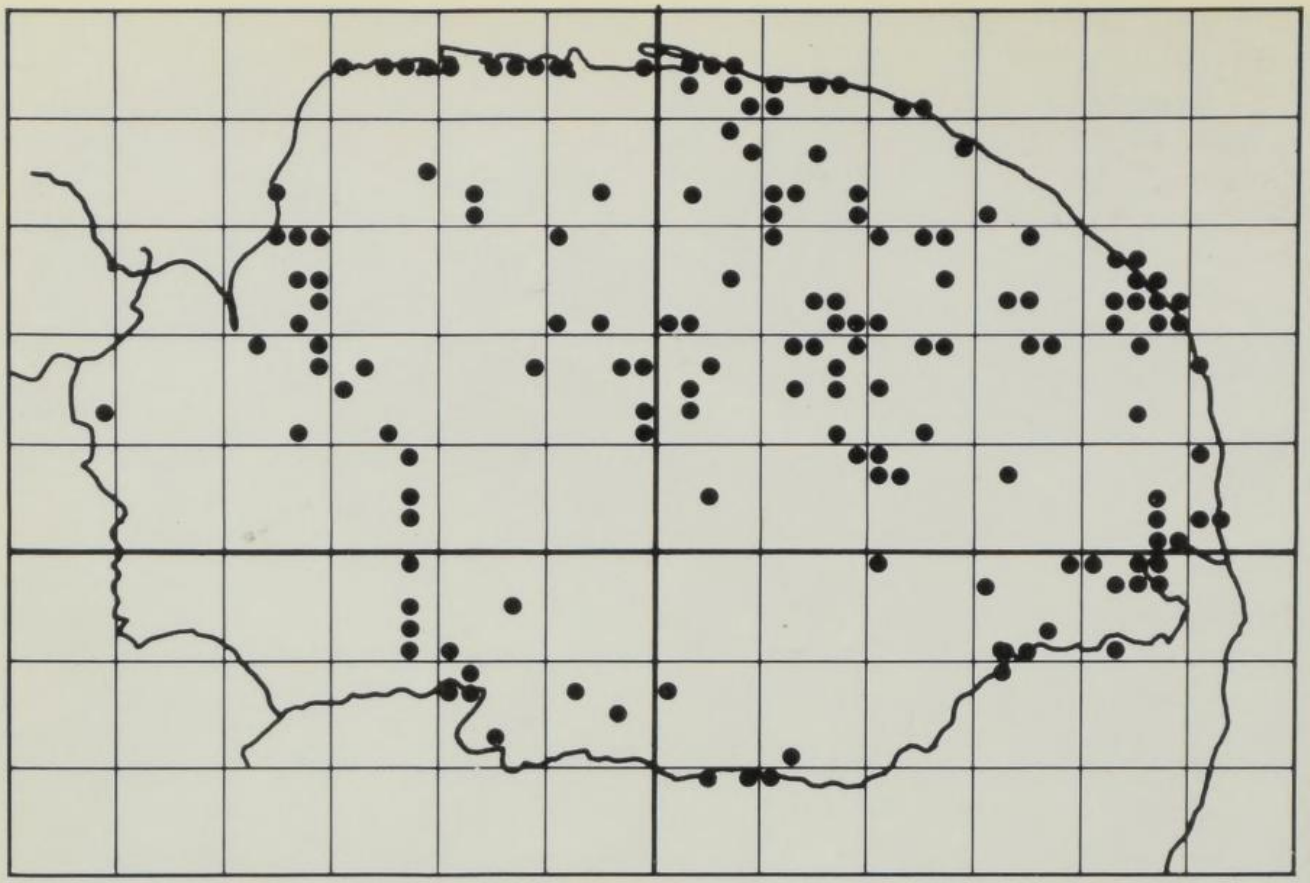

Fig. 4 Common lizard. Tetrad distribution map showing post-1970 records.

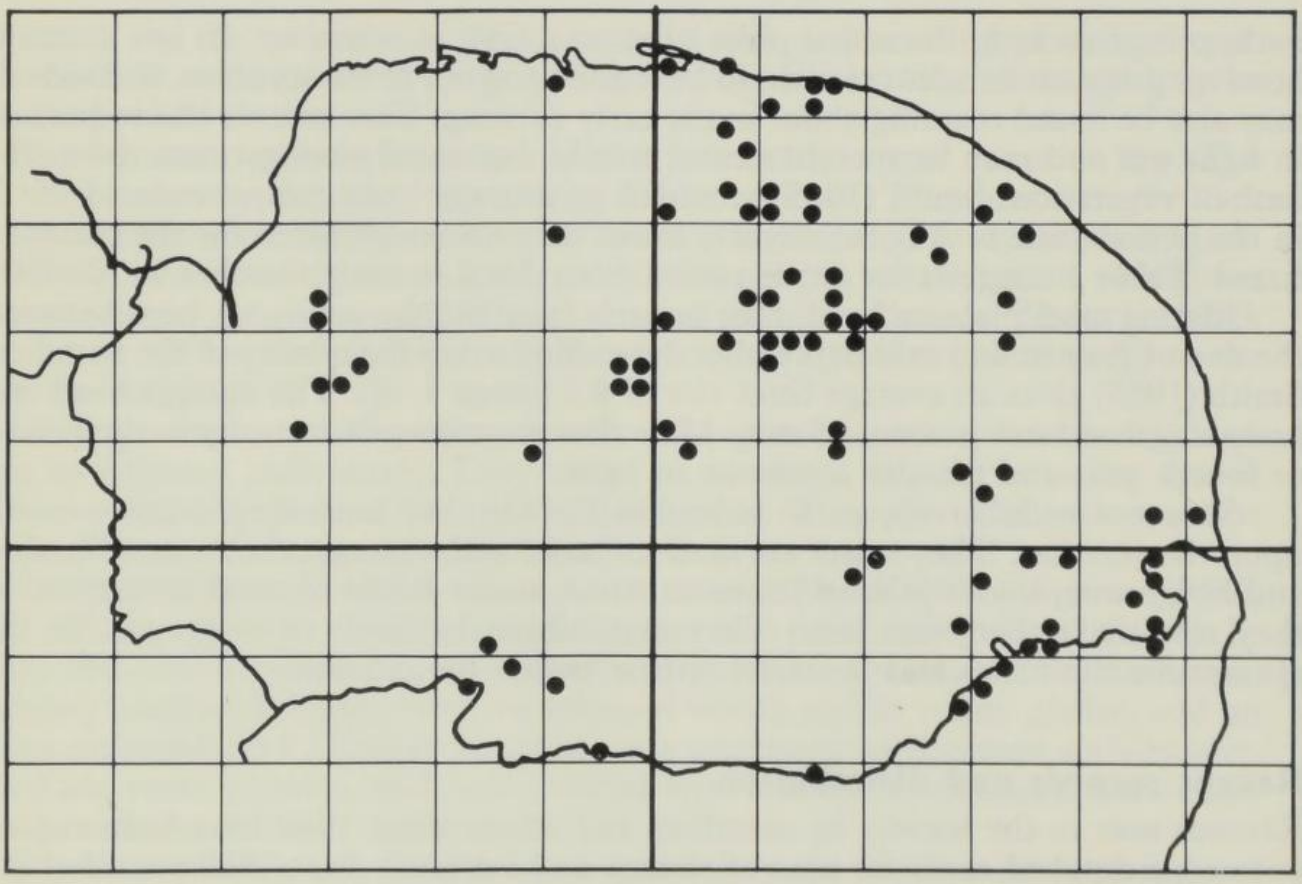

Fig. 5 Slow worm. Tetrad distribution map showing post-1970 records.

attempt to survey areas for lizards and to some extent the distribution shown by the maps may reflect the activities of recorders. There is certainly scope for our knowledge of the species, distribution to be extended and updated. Doubtful and unconfirmed records have been omitted from the maps together with some where the precise locality could not be determined. Full details have been supplied to the Biological Records Centre at Monks Wood and to the data bank at the Castle Museum, Norwich.

The common lizard is the most widespread reptile in the county, but there are some 10 km squares in which it has yet to be recorded, (Fig.4). Unlike the other species it is found at sites along the north coast in West Norfolk. It is likely to occur wherever there is suitable habitat. Table 1 suggests that April to July and August are the peak times for recording this species and visits to likely areas during suitable weather could extend the known distribution of the species in the county.

Although the slow worm's distribution is as yet incompletely known in parts of the county, some interesting features are beginning to emerge. Its absence from the well recorded broadland 10 km squares of TG41 and TG42 reflects the species' avoidance of low lying areas subject to flooding. This assertion is in agreement with Ellis (1965) who wrote "...hardly ever met within marshes subject to flooding, but inhabiting some of the adjacent ground, usually where this is sandy and supports a vegetation largely of grasses, gorse and bracken." With the exception of a single record from a garden in Wells the slow worm, like the adder and grass snake, is apparently unknown in NW Norfolk. The main area for records is the tract of countryside from central Norfolk to NE Norfolk where suitable habitat exists (Fig.5). It is also found in sites associated with the Holt/Cromer ridge, in SE Norfolk and sites along the county boundary with Suffolk. Further records come from Breckland and west Norfolk heathlands. No records have been received from the fens and more field work is needed to confirm the absence of the species in that part of the county.

The habit of basking in sunshine makes the common lizard the easier of the two species to find. Systematic attempts should be made to try to fill some of the gaps in the distribution map and at least determine whether it can be found in each of the county's 10 km squares. Although more difficult to locate by direct observation in suitable habitat the slow worm can be found by searching under objects lying on the ground. Some naturalists/scientists have solved the problem of trying to locate this species by putting out pieces of scrap metal for slow worms to hide under. This type of study needs to be conducted discreetly and the metal removed at the end of it. Another approach may be to search for this species on warm summer evenings when they have been found in the open.

Changes in status and conservations

There can be little doubt that both species have declined in abundance since the middle of the last century when Southwell (1871) commented upon their status. He recorded the common lizard as frequent on heaths, hedge banks, and dry places and whilst the same is broadly true today such habitats are now much rarer. The loss of heathland sites to afforestation, agriculture and other uses will have had as deleterious an effect upon the slow worm and common lizard as upon the adder and grass snake (Buckley, 1987). In addition to the loss of heathland there has been the much publicised loss of hedgerows in recent decades. The loss of hedges and their associated banks will have caused the extermination of lizard colonies without a trace. The loss of suitable habitat can be due to more subtle changes than ploughing

or afforestation. Ellis (1965) noted the disappearance of the common lizard from many of the mowing marshes of broadland after the cessation of mowing. In a similar way the loss of the rabbit due to myxomatosis after 1953 must have had a powerful influence upon the availability of lizard habitat. Grazing by rabbits kept the vegetation short, hindered plant succession and thus provided plenty of sunny patches for the common lizard. Pollard, Hooper, and Moore (1974) mention that the common lizard appeared to be much less common along the woodland edges and hedgebanks of the Wealden sands district after 1953 than formerly.

Southwell (1871) considered the slow worm to be not uncommon on heaths and in dry woods. Miller and Skertchly (1878) described it as apparently less common in Cambridgeshire than in most parts of the country and Gadow (1904) considered it to be very local and rare. Lubbock (1879) records the observations of Rev. H. T. Frere of Burston where slow worms were considered very common, and of Mr Gambling of Norwich who recorded the birth of slow worms in September 1877. Lubbock, like Southwell, considered the slow worm to be not uncommon. Presst et al. (1974) noted that although neither species had been the subject of a special study, they were unlikely to be endangered on a national scale. More recently Cooke and Scorgie (1983) conducted a survey of the status of the commoner amphibians and reptiles in Britain. They used a questionnaire and asked recorders to give the status of the various species in 1980, the change of status since 1970 if any, and the reason for any change in status. The responses were then processed to give indices of abundance (range 0-1) and changes of status (range -1-+1) on a regional basis. In East Anglia the common lizard was considered to be widespread and fairly common (index 0.73), the slow worm fairly widespread but not common (index 0.63). The responses of the 10 East Anglian recorders indicated that both lizards had decreased in abundance, the common lizard (index of change -0.48) more so than the slow worm (index of change -0.34). The results suggest that the common lizard, the most common reptile, had declined the most. Ninety three percent of the reasons given for the decrease in the common lizard were the loss of suitable habitat. The slow worm had the lowest status index of the 4 reptiles in the region, but the second lowest index of change. Seventy percent of the reasons given for the decrease related to habitat loss, the others being predation, road casualties, collection and agricultural chemicals.

Since 1981 the four common reptiles have been protected under section 9(5) of the Wildlife and Countryside Act. This simply means that they cannot be sold without a licence. Unfortunately at least one Norwich pet shop has such a licence and sells native species. This is to be regretted because a trade in native species encourages collectors to take more specimens from the wild than they might otherwise do and over-collection can lead to local extinctions. The common species would certainly benefit from legal protection such as that given to the rarer species—the smooth snake, sand lizard, natterjack toad and great crested newt. In 1986 the Fauna and Flora Preservation Society proposed legal protection for all the commoner species of reptile and amphibian (Langton, 1986). This year, because of a lack of agreement between conservation bodies, it was decided to press the government to give greater legal protection just to the reptiles and not the amphibians. In December Nicholas Ridley rejected the advice of the Nature Conservancy Council and excluded the adder from the new legislation which makes it an offence to kill or injure the grass snake, slow worm and common lizard. Whilst this may be seen as progress there is an obvious loophole in the law. Any person killing a slow worm, grass snake

or smooth snake can simply claim that they thought it was an adder. The common lizard has never been under threat, simply from people killing it, but the slow worm is quite often killed by people thinking it might be a poisonous snake. Only when all snakes are protected wil the slow worm benefit from the recent legislation. By failing to give the adder any legal protection the government has failed entirely to implement a Council of Europe Committee of Ministers' resolution made ten years ago, (Keith Corbett pers. comm). Lizards are in a situation which is unlikely to improve except where favourable management is undertaken. Not only have their habitats been lost to urban developments, agriculture, gravel extraction and afforestation, but also by plant succession to woodland. Lizards have very poor powers of dispersal and habitats created by taking land out of agriculture or making road cuttings etc are likely to remain uncolonised by these species.

Many former heaths exist only as names on an ordnance survey map e.g. Massingham Heath and Roughton Heath. Others have been reduced to a mere fragment of their former extent, e.g. Syderstone Common and Mousehold Heath. Unfortunately it is not enough to protect heathland against physical loss: it also requires management. Rackham (1986) documents the decline of Mousehold Heath from its former 6,000 acres to its present 180 acres. He also suggested that soon it would completely disappear. This formerly wild and glorious place, once an inspiration to George Barrow and the Norwich School of artists is degenerating into an indifferent kind of woodland. Its owners, Norwich Corporation, have yet to show the resolve necessary to halt this sad decline. On Mousehold much scrub needs to be removed from heathery areas and trees felled to allow the ground cover to regenerate. Whilst it is to be regretted that some land owners have neglected their heathland it is even more unacceptable for public bodies and conservation organisations to do the same. The county needs a heathland policy to identify and help conserve the heathland fragments which still remain.

Heathland, because of its small number of plant species, has been the neglected habitat of nature conservation. Ancient woodland, chalk grassland, bogs and fens have attracted more attention. In the absence of grazing or management many heaths have been maintained largely by fire and the myth has grown up that this is the tool to be used. Fire kills reptiles unless they are underground and should they survive the fire they then have no habitat in which to feed and elude predators. After a fire it is some time before the habitat becomes suitable for lizards again. A study made by Simms (1969) in Yorkshire shows that it takes at least 3 years for a burned area of heath to acquire a population of common lizards comparable to the pre-fire level. Webb (1986) suggests that fire was not used as a management tool on lowland heaths until they began to fall into disuse at the beginning of the 19th century. It would have been wasteful to have burned the useful materials which heathland provided.

Fire is an ever present threat to heathland and sites need to be fire-breaked prior to scrub clearance. When the vegetation is free of tall gorse and other scrub a relatively narrow strip of bare soil can prevent the spread of fire across the heath. These breaks by their very nature provide sandy areas which have been a missing component of many heaths since the demise of the rabbit and the cessation of turf cutting.

Although heathland is still under threat by the pressures outlined above there are some grounds for optimism. Even the most promising piece of heath is worth keeping as it can be restored by appropriate management. Owners of such habitats should be encouraged to manage them in a sympathetic way and when necessary

receive financial help for doing so. In the next year or so it should be possible to identify and establish sites within Forestry Commission holdings in Norfolk for reptile conservation and this will be of direct benefit to the species. Naturalists can continue to help in many ways; by recording their observations, supporting the actions of County Trust and Nature Conservancy Council, undertaking their own conservation projects, and putting the case for conservation of particular sites to land owners and planners.

Acknowledgements

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RECENT RECORDS OF INVERTEBRATES

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These notes supplement the reports on woodlice, false-scorpions, centipedes and millipedes published in these Transactions (Irwin & Jones, 1984; Jones, 1985, 1986, 1987), and also give an account of the terrestrial flatworms of Norfolk. Records are by the author unless otherwise stated. Full details have been deposited in the Norfolk Biological Records Centre and with BRC, Monks Wood.

Woodlice

Armadillidium nasatum Budde-Lund and *Porcellio laevis* Latreille have both been collected from a rubbish tip at Appleton in W. Norfolk on several occasions and appear to be well established colonies. *P. laevis* has also been collected by J. G. Goldsmith from a rubbish tip at Methwold Hythe. The first record of *Porcellio dilatatus* Brandt from E. Norfolk since the 1940's was of one collected from Flordon Common in May 1986. *Trichoniscoides albidus* (Budde-Lund) is still underrecorded but specimens have been collected from a ditch in the Gaywood Plantation at King's Lynn, a river bank at Welney and a wood at Woodton.

One new species has been added to the county list and that is *Trachelipus rathkei* (Brandt). The author first collected this species at Welney in September 1984. The site is within the modern administrative county of Norfolk but outside of the W. Norfolk vice-county by about 20 feet, (the width of the road that forms the boundary!). Attempts to find it on the other side of the road were not successful. The first official Norfolk record from vice-county 28 is thus from Hockwold cum Wilton where A. G. Irwin collected it on 7 May 1985. The animal has colonised the man-made river banks which cross the fens and which appear to provide a similar habitat to that of the damp, rough grassland on clay soils in which it occurs in the Northamptonshire and Huntingdonshire vice-counties.

Centipedes

A new addition to the county list is *Geophilus fucorum serauti* Brolemann, a single specimen of which was sieved from muddy shingle on the landward side of Blakeney