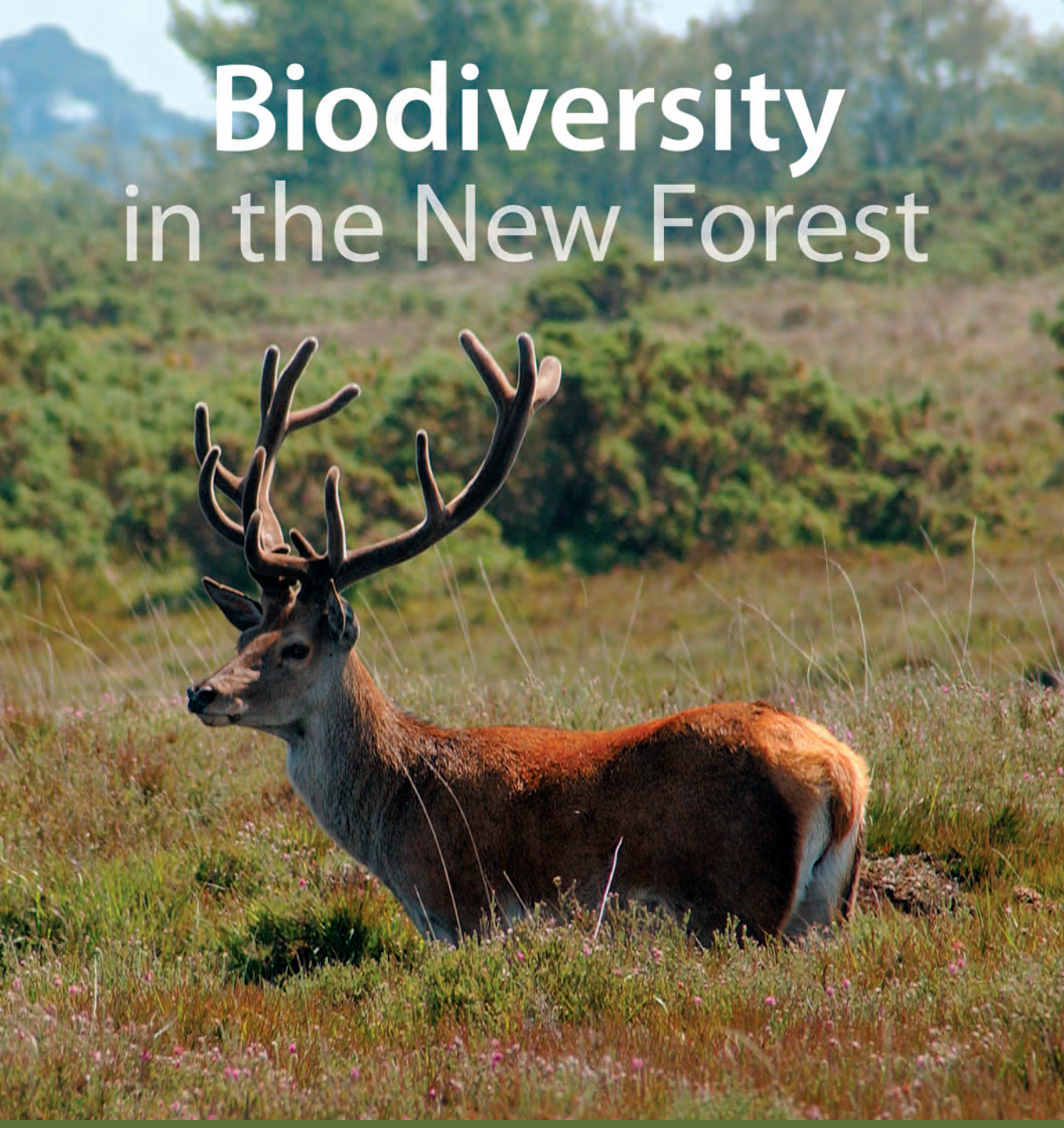
Biodiversity in the New Forest



Edited by Adrian C. Newton

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Dedicated to the memory of
Muriel Eliza Newton (1929–2009),
who loved the New Forest,
especially the donkeys.

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Back cover: Wood Crates (Adrian Newton)

The maps in this book are for illustrative purposes only, and do not represent the legal definition of National Park boundaries or any other feature

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7 The New Forest cicada and other invertebrates

Bryan J. Pinchen and Lena K. Ward

Introduction

The New Forest supports important populations of a wide range of invertebrates associated with many different habitats. The woodlands are recognised as being of outstanding importance, and one of the ecological characteristics giving them national and international importance is an exceptionally rich invertebrate fauna, particularly the deadwood invertebrate fauna. Inside the Forest perambulation (as opposed to just the SAC) 445 species of Coleoptera, Hemiptera, Diptera, Orthoptera and allies and Hymenoptera (published data to April 1999) that are categorised as Nationally Scarce and Red Data Book (all categories) species (Pinchen 1999) occur, from a UK total of 2,330 species in these groups (see also Table 17 for the SAC totals). This can broken down by habitat into Bog Woodland 17 species, Forestry Inclosures 34, Ancient and Ornamental Woodland 166, Riverine Woodland 20, Dry Heath 70, Wet Heath 40, Mires 41, Temporary and Permanent Pools 31, Rivers and Streams 23, Wet Grassland 22 and Dry Grassland 9 species. (Repetition of species occurs where they may be present in, or dependent on, more than one New Forest habitat.) These figures were pooled from the unpublished invertebrate site registers held by English Nature and the Hampshire Biodiversity Information Centre (Court 1998, English Nature 1985), and largely cover the period between 1970 and 1998. Overall this seems a rather small total when considered against the range of different habitats and the total of 29,262 ha (SAC) of available habitat in this southern county in the UK, where there is a high species richness of other groups. Unfortunately data are not available to compare these figures with other similarly sized individual habitat features (e.g. other Bog Woodlands).

There are serious difficulties in providing an overview of the current status of the invertebrate fauna because, with the exception of Lepidoptera and Odonata (see Chapters 4 and 6), the New Forest seems to have been poorly recorded for invertebrates over recent years. For example, the stag beetle *Lucanus cervus* was recorded as nationally rare (Cox 1997). However, a recent national survey received over 10,000 records (Robb 2001), suggesting that this species should no longer be regarded as nationally rare. This survey also revealed that the species was commoner in local gardens than in the New Forest itself, although the latter has not yet been systematically surveyed for this species (see Chapter 5). Conversely, other rare species have not been recorded for many years and may be extinct.

For many insects a lack of recorder effort may also be related to a reduction in the numbers of specialist entomologists, and to a consensus that there has been a decline in the number of insects to collect, as well as the general unwillingness of many entomologists to undertake surveys because of the need for permit application and Public Liability Insurance now required even to wield a net. Even recent innovations such as the LIFE II and LIFE III Projects (see Chapter 17) have focused on undertaking (often dramatic) habitat management works with little consideration given to surveying the habitats either prior to or after such works are undertaken, to assess their effectiveness in providing 'improved' habitats. Large-scale habitat changes should be more carefully monitored in future.

This chapter first provides an overview of one of the most notable insects associated with the area, the New Forest cicada *Cicadetta montana*. This provides a relatively well documented example of a species that has declined significantly in recent years, apparently as a result of a reduction in habitat availability resulting from changing management practices in the New Forest. In particular, an increase in grazing pressure appears to have had a negative impact on the abundance of this species. The potential impacts of grazing of a range of other invertebrate species, associated with a variety of different habitats, are then considered.

Table 17
Notable invertebrates by group and status, recorded in the New Forest SAC (adapted from Wright and Westerhoff 2001). (RDB refers to Red Data Book).

Status	Coleoptera	Hymenoptera	Diptera	Orthoptera	Hemiptera	Araneae	Crustacea	Annelida	Mollusca
RDB1	16	5	7	1	1	-	-	-	-
RDB2	6	3	13	1	-	-	1	-	-
RDB3	23	17	28	1	5	1	1	1	1
RDBK	6	1	2	-	-	-	-	-	-
Notable A	34	6	-	3	-	-	-	-	-
Notable B	138	8	33	6	3	-	-	-	-
Notable	17	-	17	-	-	-	-	-	-
Total	**240**	**40**	**100**	**12**	**9**	**1**	**2**	**1**	**1**

The New Forest cicada

The problems of understanding the status of a rare insect are illustrated by the New Forest cicada, *Cicadetta montana*. As the only representative of the Cicadidae in Britain, this species is something of a speciality of the New Forest, which is the only area in the country where the insect is now thought to occur. The ecology and conservation of this species are described in detail by Pinchen and Ward (2002), on which this brief account is based.

This species has always been very sporadic in occurrence, being recorded from only 26 New Forest localities since 1812 (Pinchen and Ward 2002). A good site near Brockenhurst was well known to collectors until about 1913, and there were a few records between the two World Wars, but after a sighting in 1941 the species was then thought to be extinct. In 1962 a population of about 100 singing males was discovered in the northern part of the New Forest. This population was monitored and studied for 30 years during its long decline to only a few specimens in the mid-1990s (Grant and Ward 1992, Grant 1972, 1970). Since 1991, when the species was included in the English Nature Species Recovery Programme, there have been publicity campaigns for naturalists to search for this elusive insect, as well as surveys by specialists, but there have been only a very few records of possible song in this period.

The cicada is most closely associated with open deciduous woodland, with scattered bushes and wide clearings. The adult phase typically lasts from two to four weeks, with adults usually on the wing from late May to mid-July. Eggs are oviposited in small-diameter stems of herbaceous plants, bracken, and small trees and bushes. Nymphs have been observed feeding on the roots of purple moor-grass *Molinia caerulea*, and may also feed on other species, although this has not been confirmed in the New Forest; adults feed on small twigs of various trees, where they suck the phloem.

The cicada occupies the successional habitat between open heath or grassland and scrubby woodland, and requires open sunny woodland rides and clearings, bordered by scrub or woodland edge. South-facing, well-drained slopes are preferred, and a structured and mixed flora of herbs and shrubs is essential, to provide food sources and oviposition sites. Heavily grazed sites are wholly unsuitable; as a result, all modern records have been made in relatively ungrazed forestry Inclosures. Adults disperse to found new colonies when the successional habitat of young scrub becomes overgrown, but these new populations are particularly hard to find. This is because colonies may be very small and intermittent, with a long generation time of between six and 10 years underground, as well as the short flight season, often among trees, and the high-frequency male song that is inaudible to most persons over 40 years of age. There have been definite records up to 1996 on the northern known area and around Denny Wood, and there have been other possible records of song since then. However, numbers of singing males declined markedly at this known northern site from around 100 in 1962 to around four or five in the early 1970s, with only occasional observations made since then.

The decline in the cicada population can be attributed to habitat changes, resulting from succession to woodland, and changing forestry practices; traditional coppice rotations are more likely to provide suitable conditions than the longer rotations employed by modern commercial forestry. The cicada might have moved around in coppice/felled systems, which would have provided a sufficiently long rotation time to complete their life cycle, but we envisage this as a 'hanging-on' situation compared with natural forest glades under intermittent grazing. In more 'natural' systems the cicada and other insects would have been associated with the transitional woodland edge zone where successional scrub of the right size and age would have been present. The preferred cicada habitat is of ungrazed warm glades with small shrubs and taller herbs where oviposition can occur at lower levels in stem diameters of about 5–15 mm. However, shorter, younger scrub, and even blackthorn *Prunus spinosa*, a noted host of ovipositing cicadas in continental Europe, are quite scarce in these situations. This may be why oviposition in bracken occurs in the New Forest (not recorded elsewhere), although this tends to be an unsuitable host because the stems often split before the nymphs emerge in the autumn.

Most significantly, when the cicada was rediscovered in 1962, grazing pressures were less intensive than they are today. Heavy and increased grazing pressure in the Open Forest removed low-growing oviposition sites for females, and the herbs required as a nymphal food source. The graduated transitional zone between open heath and scrub edge and the early successional scrub, which are the favoured habitats, are now relatively rare and are mostly confined to the forestry Inclosures. Proposals to remove Inclosure fences are likely to lead to the loss of lightly grazed scrub, and are likely to have further negative effects on the cicada, as on many other invertebrate species (Pinchen 2000).

The impacts of grazing

Changes to the grazing regime and management of the heaths and woodlands on a significant scale are likely to have had a detrimental effect on various insect species and their habitats. Grazing levels have increased since the fencing and gridding of the Forest perambulation in the early 1960s, and the ways in which the woodlands and heaths are managed have changed considerably since the decline of 'traditional' commoning (e.g. bracken is no longer harvested for bedding or fodder, and turfs are no longer cut/removed). However, as there has been a serious lack of directed quantitative survey and research on the current status of invertebrates, the evidence for declines (or gains) can be hard to establish. A minimal survey was funded in 1998 and 1999 to look at a few

Inclosures that were proposed to be opened to livestock. While the overriding message of the report was that more survey was needed and that opening the Inclosures to the heavy grazing pressure of the Open Forest would be quite detrimental to insects (Pinchen 2000), they were still opened and no further survey or research appears to have been undertaken since then to assess the impact. Searches of historical records prior to this survey produced none more recent than a 1985 NCC Butterfly Survey.

Many entomologists consider that the New Forest is currently under very severe grazing pressure, and as a consequence the habitat quality for many insect groups that were formerly considered typical of the area has degenerated markedly. Very few terrestrial insect species have been recorded in recent entomological surveys on the Open Forest. Even those regarded as being common, widespread and familiar elsewhere are rarely recorded and often absent. However, while the decline of butterflies in the New Forest Inclosures has been highlighted by Oates (1995) (see Chapter 6), care must be exercised when attributing declines in insects solely to increases in grazing pressure on the Open Forest alone. The intensification of farmsteads within the Forest and the loss of small rotationally managed fields must also have had a devastating effect upon insect populations in the Forest, as it has throughout the wider countryside.

Invertebrates in grazed areas (Open Forest)

Stock densities have increased across the Forest as a result of the fencing and gridding of the perambulation. Current levels of pony stocking are at an all-time high with an increase in pony numbers from about 1,700 in 1960 to 3,500–4,000 in the 1990s, although this was initially offset by a decline in the numbers of cattle after the 1960s. By the 1990s the head count of cattle had returned to the figures depastured previously (Tubbs 1997). Some of the responses by commoners (who no longer ran stock on the Forest) to a questionnaire published in 1984 indicated that the quality of grazing had declined (Countryside Commission 1984). In addition to this, the provision of supplementary winter feed (which is allowed in some circumstances, and provided without permission in others) for livestock also suggests both a lack of winter grazing available on the Open Forest, and a lack of sufficient fall-back land to support the numbers of stock. This would suggest that there are either too many animals present for the grazing available or that the winter grazing is of poor quality. Either way the number of depastured livestock needs to be reassessed and ideally significantly reduced. The decline of rotationally managed pastures off the Forest has also had a significant effect, as was seen when the livestock (cattle) were culled during the 2001 Foot and Mouth outbreak, as Forest farmsteads could not support the numbers of livestock depastured (B.J.P., pers. obs.).

Putman (1986) classified New Forest grasslands in relation to grazing as 'short grass' <20 mm, while long grass was described as being within the height range '20–50 mm'! This illustrates the over-grazed nature of the Forest grasslands, as very few herbs are given the opportunity to flower or grow to their normal size and grass tussocks do not form as they would if stocking rates were reduced. In his analysis of the 'effects of the grazing on the Forest's other animals', Putman (1986) does not mention vegetation height in relation to invertebrates, but many of the associated insects would be seriously affected, with immediate damage or loss caused by direct trampling and the removal of eggs, larvae and even adults. At the same time the loss of habitat variously affects feeding, reproduction, sheltering and hibernation sites. Elsewhere it has been shown that species richness of plants peaks in shorter grassland, but the species richness of insects is greater in tall ungrazed (or more lightly grazed) grasslands (Pöyry *et al.* 2006, Kruess and Tscharntke 2002).

A variety of grassland heights is important in conserving a range of insects; e.g. different turf heights are used by different grassland butterflies, ranging from 0–4 cm for Adonis blue *Lysandra bellargus* to 20–>30 cm for wood white *Leptidea sinapis* (Oates 1995). These species are not directly relevant to the New Forest, but illustrate the way in which invertebrates utilise the range of structural variation within grassland habitats. Brown and Searle (1974) described the Orthoptera as being 'very common' in the Forest in 1972, but bush crickets and grasshoppers are now scarce on the Open Forest as there are fewer places for them to feed and their numbers are greatly reduced; because of the increase in grazing and browsing pressure, many now have a patchy distribution. Otherwise widespread species such as the common green grasshopper *Omocestus viridulus* also appear to have declined since the early 1990s, and records are very scarce in recent times (B.J.P., pers. obs.). The Inclosures that have the best ground flora structure are now probably the main stronghold of this group (Tubbs 1986; B.J.P., pers. obs.). Similarly, Heteroptera appear to be particularly scarce in the New Forest, apart from a few tree and shrub specialists, because of the loss of the herb layer that the majority feed on. Many terrestrial heteropterans feed on plant sap obtained from soft-stemmed herbs or feed on plant seeds. Plants do not grow to any appreciable height owing to the grazing, so that stem availability is reduced, and the removal of flowers eliminates seed production.

This loss of diverse, continuous and varied flower resources seriously affects nectar-feeding and pollinating insects. Indeed, the greatest numbers and diversity of these insects can be found on the road verges within the Forest that are not grazed but are occasionally mown. Good examples with varied structure and a variety of flower-heads can be seen in summer on the A337 (Lyndhurst to Lymington) and the A35 (Lyndhurst to Christchurch) roads that cut through the forest. On these road verges grazing pressure is largely non-existent (mowed twice a year), flowers are plentiful and there is a noticeable

variation in the vegetation structure (B.J.P., pers. obs.). Comparative survey of road verges and the open forest would be an interesting subject for future study.

These nectar- and pollen-dependant species are particularly hard hit by heavy and continuous grazing pressure. The most obviously affected species are the Hymenoptera (bees, ants and wasps) and the Diptera (flies). From personal observations, the bulk of Hymenoptera recorded during visits to the Open Forest and the Inclosures are those that provision their nests with paralysed live prey, such as homopteran bugs that have often been collected from trees and shrubs. Limited numbers of adult Hymenoptera are recorded on flowers, including species that are parasitoids or aculeate bees and wasps that nest in standing dead wood, while a few use bare ground. Many of the adult Diptera recorded on flowers develop as larvae in rot holes (e.g. some hoverflies), in the sap-runs of old trees, in decaying plant material or in dung (e.g. robberflies, Asilidae). The large and impressive hornet robberfly *Asilus crabroniformis*, a BAP species, is exceptionally rare on the Open Forest (B.J.P., pers. obs.) but abundant on the grasslands and heaths outside the perambulation to the south near Fawley and across the Dorset heaths. This species requires animal dung for oviposition but preys as an adult on terrestrial and usually highly mobile insects, and is likely to have been affected by the absence of insect prey. Even familiar species such as bumblebees *Bombus* spp. are hard to find because there are so few forage resources available throughout the summer period, and these species need a constant forage source from March through to September.

The spread of bracken on the Open Forest because of its resistance to grazing also has a deleterious effect on insects and invertebrates, e.g. grasshoppers (Ragge 1965). This is due to both the shading of the ground flora reducing host plants and the lowering of the ground temperature, which can have a serious effect on surface and underground stages of many insects (e.g. the cicada).

In recent years a severe threat has appeared to species that nest in bare ground, especially solitary bees and wasps. A recent trend has seen the 'improvement' of sandy footpaths and tracks for access to bicycles and horses by resurfacing them with compacted gravel and clay. Not only does this imprison any species that had already nested, but makes the new surface wholly unsuitable for nest excavation. Between 130 and 180 species of ground-nesting solitary bees and wasps may nest in and around sandy exposures on tracks, footpaths and bridleways, along with as yet undetermined numbers of beetles, flies and bugs. Despite awareness of this damaging practice being raised by the Heathland Fly BAP group, little consideration appears to be paid to the concerns at present (S. Miles, pers. comm.). A survey of invertebrates utilising newly created areas of bare ground at Hyde Common in the north of the New Forest, near Mockbeggar, has shown that species with a dependence on bare ground for nesting can decline in numbers quickly, as the bare areas revegetated after as little as three or four years. These areas need to be regularly disturbed (Pinchen 2007).

The removal of large carrion is another overlooked invertebrate habitat issue that requires some consideration on both the open forest and in the woodlands. When grazing animals die they are removed from the Forest as soon as possible. This therefore prevents the large-mammal carrion invertebrates and their predators from playing their natural part in the ecosystem.

Invertebrates in woodlands (Open Forest and Inclosures)

Here we discuss the current condition of the woodland habitats in relation to insects and invertebrates, and assess some of the threats faced by a range of invertebrate groups. It is useful also to consider the dynamic aspects of woodland communities (see Chapter 13) and how these should be temporally balanced from the earliest seral stages through all ages leading to ancient high forest (Chatters and Sanderson 1994). At the present time the temporal sequence is unbalanced (Tubbs 1986), with a paucity of young regenerating stands and over-representation of ancient dying trees. The New Forest cicada is an example of an insect that is particularly associated with ungrazed seral scrub and woodland edges. Some aspects of recent research (Pinchen and Ward 2002) have led to insights into this diminishing habitat. Other species may be similarly affected, based on anecdotal evidence gathered over a number of years both within and on land immediately outside the New Forest.

There are different woodland types; those woodlands (and grasslands) on shallow sandy soils are likely to have a more impoverished flora compared to those on the richer clays. However, each will have its own unique assemblage of invertebrates that will be adapted to these conditions. Woodlands comprising chiefly beech *Fagus sylvatica* and pine *Pinus sylvestris*, and particularly plantations of conifers, contain fewer flowering plants/fauna owing to their lower light availabilities under the canopy.

Open woodlands with old trees are of particular significance for the saproxylic insect fauna (see Chapter 5). Two UK sites, the New Forest and Windsor Forest and Great Park, have been identified as of potential international importance for their saproxylic invertebrate fauna (and bryophytes) by the Council of Europe (Speight 1989). However, of the 10 species on the grouped JNCC Action Plan (JNCC 2007) none appears to have been recorded in the New Forest post 1970 (but see Chapter 5). Saproxylic habitats in old pasture woodlands are less susceptible to excessive grazing pressure (although the adult stages of many saproxylic invertebrates do also have a requirement for nectar and pollen). The lifetimes of these old tree habitats are relatively long and currently reasonably good, but nevertheless there is a need to maintain a

supply of replacement trees, which will eventually be a problem in the New Forest because of the currently uneven age structure of the trees of the forest (Tubbs 1986).

The Inclosures currently provide a habitat with a mixed vegetation structure and availability of the flower resources and taller herbs that are poorly represented elsewhere in the Forest. It is only really in these areas where nectar- and pollen-dependent insects and successional habitat species can survive. However, even these Forestry Inclosures are significantly browsed by deer, as well as grazed by ponies that are not completely excluded by the fencing, so that in practice this habitat component is not well represented. The regeneration of scrub and young trees is almost non-existent and the shrub layer often very poor. This distinct lack of scrub has an effect on invertebrate populations, as also on small mammals and birds (particularly passerines, which can be surprisingly scarce in the Forest woodlands; see Chapter 1). Many adult deadwood (and other) insects can be found at hawthorn *Crataegus* sp. blossom in the spring and the lack of this shrub and other early flowering shrubs may be one reason why there appear to be so few records of adult deadwood insects. The general paucity of many butterflies, particularly woodland species, e.g. silver-washed fritillary *Argynnis paphia* and white admiral *Limenitis camilla* is probably attributable to the lack of flowering brambles *Rubus* spp., brought about by the browsing and grazing pressure that affects many invertebrates (Stewart 2001). At present the Inclosures with least grazing pressure and the woodlands on the outskirts of the Forest perambulation that are being managed with controlled grazing or careful mowing regimes appear to support a greater diversity of insects than the Open Forest and its woodlands (Palmer 2000).

Personal observations and limited survey from two ungrazed/controlled grazed woodlands in the New Forest area have shown a greater diversity of insect species than many of the Forest Inclosures. The two woodlands were Sims Wood (part of the North Solent National Nature Reserve near Beaulieu) and Roydon Wood (Hampshire Wildlife Trust reserve) near Brockenhurst. Sims Wood (SU4101) is a mixed deciduous wood (with some conifers) of 58 ha. Light browsing pressure came from a small population of roe deer *Capreolus capreolus* and the wide, floristically rich rides were cut on a two-year rotation with all cut material being removed. Between 1995 and 1999 31 species of butterfly were recorded on regular transects, including silver-washed fritillary, dark green fritillary *Argynnis aglaja*, pearl-bordered fritillary, grizzled skipper and white admiral, all in high numbers. Limited moth trapping work produced 134 species of macromoth including five Nationally Scarce species. Other groups included 155 species of spider with 15 Nationally Scarce species, seven harvestmen and three pseudoscorpions as well as in excess of 50 hoverfly species including one Red Data Book 1 and five Nationally Scarce species. Seventeen species of Orthoptera and allies were also present (Pinchen 1998, Jones 1997). Roydon Wood (SU310003) is grazed at varying densities at differing times of the year by a small herd of cattle and contained a floristically rich and well-structured sward, and subsequently high numbers of insects. It was described as being '...a wonderful patchwork of many different habitats... but without the pressures of grazing' (Anon 1992). Many of the species present are dependent upon the controlled management regime and would not be able to survive the heavy grazing pressure of the New Forest. Intensive survey in 1998 recorded 1,105 insect species including 17 Red Data List species and 85 Nationally Scarce species (D. Wicks, pers. comm. in 1999, Palmer 2000).

The high numbers of Nationally Scarce and Red Data List species in these two woodlands are almost certainly a product of their lightly grazed nature and the provision of structural variation and a continuum of flower resources throughout the summer season. The total number of Red Data List and Nationally Scarce species in the small but intensive survey of Roydon Wood is almost one quarter of those recorded for the New Forest as a whole (Pinchen 1999). Of this total for Roydon Wood, Diptera made up five of the Red Data List and 20 of the Nationally Scarce species, with half of these species being deadwood specialists (Palmer 2000). It is concluded that these species, and the other insects recorded, are present because of their dependence on the relatively abundant nectaring resources that are available from spring through to autumn, whereas these are almost absent from the remainder of the New Forest.

Many forest or woodland species have a requirement for sheltered sunny open areas (south-facing slopes) with a varied ground flora and little or no grazing, which is best for a range of species and vegetation heights. The New Forest cicada is one good example of an insect needing this type of habitat, as it sings at temperature >20°C in sunny glades where there are younger shrubs with narrow woody stems for oviposition near ground level, together with underground tree roots for the later instars living underground.

Woodland management and insects

The understorey and woodland floor flora in deciduous woodland is most important to many insect species in the spring, before the canopy closes over. Light grazing of the understorey is sometimes essential to maintain plant diversity, and hence the insect diversity associated with it. Heavy uncontrolled grazing, particularly if this is continual, has been shown to be extremely damaging. Tubbs (1986) describes the rapid destruction of the woodland ground flora in Broomy Inclosure following its partial opening up to grazing by Open Forest stock. Such grazing removes all but the most unpalatable species as flowering components of the understorey/woodland floor, and can also lead to excessive poaching over large areas. Cleanliness in modern forestry techniques

is another factor affecting insects. The rarity of the white admiral butterfly can be related to the lack of the larval foodplant, honeysuckle *Lonicera* sp., as this is often removed from forest trees during the brashing stage of forestry management.

Clearfell areas in the New Forest are short of the successional flowering shrubs that are especially good for insects (and birds feeding on the insects), probably because the long years of grazing have eliminated species and also because of the length of the forest rotation. These areas are often large, making them exposed, cool and windy, and although they do provide some flower resources for a brief period they are planted quickly after felling and rapidly become unsuitable for all but a few generalist species. Unlike the old coppice system, where compartments were close together and often linked by wide woodland rides, clearfell blocks are often widely spaced apart and not linked together, leading to colonisation problems because species are physically unable to reach these new areas.

Forest rides

Warm, open forest rides provide good habitats for thermophilous insects (Sparks *et al.* 1996, Greatorex-Davies *et al.* 1994) but in the New Forest Inclosures and other associated woodlands the rides tend to be too narrow, with low light availability and poor gradation of vegetation heights between the woodland floor and the canopy. This has to be balanced against the heavier grazing by livestock or wild deer that is more likely to occur on wider rides. Ideally, a ride should be twice as wide as the tallest tree at its margins. Ride management should ensure that there is a gradation from grassland through scrub to canopy and a small proportion of all narrow, sheltered and shady rides need to be retained as a habitat for species such as carabid beetles.

Rotational management for insects

Favourable small, warm sites for insects are rare in both the Inclosures and the Open Forest today. Clearfell areas can provide suitable conditions, but tend to be ephemeral because of speedy replanting in modern forestry, but the management of seral scrub communities is a specialised nature conservation management technique that could be applied in suitable areas of the New Forest. The early stages of seral change depend on reduction or absence of grazing, the initial community and local seed parents (Ward 1990). Temporary exclosures on various time scales can then be used to achieve these early successions, for example those used to protect newly coppiced areas within woodland (Chatters and Sanderson 1994). This type of management is extremely effective in providing suitable habitat for many insect species associated with woodland, with an option to provide also for the establishment of replacement high forest trees. Rotational management for the grassland (Morris *et al.* 2005) in some of the marginal areas of the Forest should also be considered for insects.

Conclusions

Although there are few data available, anecdotal and personal observations suggest that some insects appear to be surviving well at present under the current regime of management of the New Forest. These include those species associated with trees, such as forest tree feeders, those feeding on dead wood and rotting wood and many associated with the abundant woodland fungi. Insects of very short disturbed grassland and those directly associated with the stock and deer such as dung beetles and insects in the main are relatively common. However, other insects associated with tall herbs and scrub and nectar-bearing flowers are not faring so well. These species need a radical reduction in grazing stock numbers with better successional management of the woodlands, especially the early seral stages. These requirements are not compatible with the current management of the New Forest, and although a range of species requires, or can tolerate, these less than ideal conditions, the question of what proportion of the Forest should be maintained in these relatively species-poor (for invertebrates) conditions must be addressed.

Tubbs (1986) stated that the proportion of Open Forest to total New Forest area was 50%, with the Forestry Inclosures occupying an area of about 25%. Creating open grazing (and conditions similar to those currently available on the Open Forest) to replace the Forest Inclosures should therefore be a low priority. Improved management within the woodlands, including controlled and appropriate grazing, better ride design, and provision of replacement native trees for conservation is of much higher priority. Unless major changes take place it is unlikely that the Forest will ever be as 'good' for insects as it was formerly famous for, and we will not see woodland rides of the quality of those just yards outside the perambulation that are free from the pressures of constant heavy grazing. We know of no other SSSI that would be allowed to be so heavily and continuously grazed and still classified as being in 'favourable condition', particularly at a site where insects are said to be one of the primary groups of international importance.

References

Anon. (1992). *Nature reserves guide*. Hampshire and Isle of Wight Wildlife Trust.

Brown, A. J. and Searle, C. A. (1974). The native Orthoptera of the New Forest. *Entomologists' Gazette,* 25, 85–92.

Chatters, C. and Sanderson, N. (1994). Grazing Lowland Pasture Woods. *British Wildlife,* 6, 78–88.

Countryside Commission. (1984). *The New Forest Commoners*. Countryside Commission Report CCP164.

Court, N. (1998). *Invertebrate Site Register for the New Forest, records to 1995*. Unpublished Data.

Cox, J. (1997). *New Forest Natural Area Profile*. Jonathon Cox Associates, Lymington.

English Nature (1985). *Invertebrate Site Register: The New Forest.* Unpublished report. English Nature, Peterborough.

Grant, J. A. (1970). Search for our insect singer (*Cicadetta montana*). *Countryside. Journal of the English Naturalist's Association*, 21, 301–307.

Grant, J. A. (1972). Conserving Britain's cicada (*Cicadetta montana*). *Countryside. Journal of the English Naturalist's Association*, 22, 8–11.

Grant, J. A. and Ward, L. K. (1992). *English Nature Species Recovery Programme – New Forest cicada (Cicadetta montana Scopoli) (Hemiptera: Cicadidae)*. English Nature/ NERC Contract.

Greatorex-Davies, J. N., Sparks, T. H. and Hall, M. L. (1994). The response of Heteroptera and Coleoptera species to shade and aspect in rides of coniferised lowland woods in southern England. *Biological Conservation*, 67, 255–273.

JNCC. (2007). *Biodiversity Action Plans. Grouped statement for saproxylic beetles*. JNCC, Peterborough. www.ukbap.org.uk/UKPlans.aspx?ID=341#4

Jones, D. (1997). *North Solent National Nature Reserve. Compartment 7. Sims Wood SU4101. Arachnological Survey 24 April to 24 October 1997*. Unpublished Report to English Nature.

Kruess A. and Tscharntke, T. (2002). Contrasting responses of plant and insect diversity to variation in grazing intensity. *Biological Conservation*, 106, 293–302.

Morris, M. G., Clarke, R. T. and Rispin, W. E. (2005). The success of a rotational grazing system in conserving the diversity of chalk grassland Auchenorrhyncha. *Journal of Insect Conservation*, 9, 363–374.

Oates, M. R. (1995). Butterfly Conservation within the management of grassland habitats. In Pullin, A. S. (ed.) (1995). *Ecology and conservation of butterflies*, pp. 98–111. Chapman and Hall, London.

Palmer, C. J. (2000). *Roydon Woods Reserve, Brockenhurst, Hampshire: the results of a survey of certain dipteran families undertaken during 1998*. Unpublished report to Hampshire Wildlife Trust.

Pinchen, B. J. (1998). *Butterfly Data, North Solent and Kingston Great Common NNRs, 1994 – 1998*. Unpublished Report for English Nature detailing results of Butterfly and Dragonfly Transect Data 1994–1998.

Pinchen, B. J. (1999). *A summary of New Forest invertebrates. Their status and habitat requirements*. Unpublished Report to English Nature.

Pinchen, B. J. (2000). Evaluation of five inclosures. In *The New Forest for invertebrate conservation and potential impact of grazing*. Unpublished report to the Forestry Commission and English Nature.

Pinchen, B. J. (2007). *Hyde Common SSSI. Insect colonisation of newly created bare ground areas. Survey 2007, Year 4 of 5*. Unpublished report to Hampshire County Council.

Pinchen, B. J. and Ward, L. K. (2002). The history, ecology and conservation of the New Forest cicada in Britain. *British Wildlife*, 13, 258–266.

Pöyry, J., Luoto, M., Paukkunen, J., Pykälä, J., Raatikainen, K. and Kuussaari, M. (2006). Different responses of plants and herbivore insects to a gradient of vegetation height: an indicator of the vertebrate grazing intensity and successional age. *Oikos*, 115, 401–412.

Putman, R. J. (1986). Grazing in temperate ecosystems. *Large herbivores and the ecology of the New Forest.* Croom Helm, London.

Ragge, D. (1965). *Grasshoppers, crickets and cockroaches of the British Isles*. Wayside and Woodland Series. F. Warne, London.

Robb, C. (ed.). (2001). *Findings of the 1998 national stag beetle survey*. People's Trust for Endangered Species, London.

Sparks, T. H., Greatorex-Davies, J. N., Mountford, J. O., Hall, M. L. and Marrs, R. H. (1996). The effects of shade on the plant communities of rides in plantation woodland and implications for butterfly conservation. *Forest Ecology and Management*, 80, 197–207.

Speight, M. C. D. (1989). *Saproxylic invertebrates and their conservation*. Nature and Environment Series No. 42. Council of Europe, Strasbourg.

Stewart, A. J. A. (2001). The impact of deer on lowland woodland invertebrates: a review of the evidence and priorities for future research. *Forestry*, 74, 259–270.

Tubbs, C. R. (1997). The ecology of pastoralism in the New Forest. *British Wildlife*, 9, 7–16.

Tubbs, C. R. (1986). *The New Forest*. New Naturalist Series 73. Collins, London.

Ward, L. K. (1990). Management of grassland scrub mosaics. In Hillier, S. H., Wells D. and Walton, D. W. H. (eds.) *Calcareous grasslands, ecology and conservation*, pp. 134–139. Bluntisham Books, Bluntisham.