GRASSHOPPERS AND BUSH-CRICKETS (ORTHOPTERA) OF MILITARY TRAINING GROUNDS NEAR COLCHESTER

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Abstract

The Orthoptera of three military training areas near Colchester in Essex have been surveyed since 1980. Two locally scarce orthopterans were recorded: Mottled Grasshopper *Myrmeleotettix maculatus* Thunberg and Great Green Bush-cricket *Tettigonia viridissima* L. *M. maculatus* is a bare earth specialist and can be classed as disturbance-dependent, whereas *T. viridissima* is a disturbance-averse insect of scrub. Disturbance-dependent insects are reliant on explosions and vehicular usage on Ministry of Defence (MoD) sites to maintain patches of exposed soil, whereas those averse to disturbance need an absence of these activities. Military usage may create the necessary patchwork of vegetation cover needed by both types of insect.

Keywords: Disturbance, Acrididae, Tettigoniidae, bare earth, succession

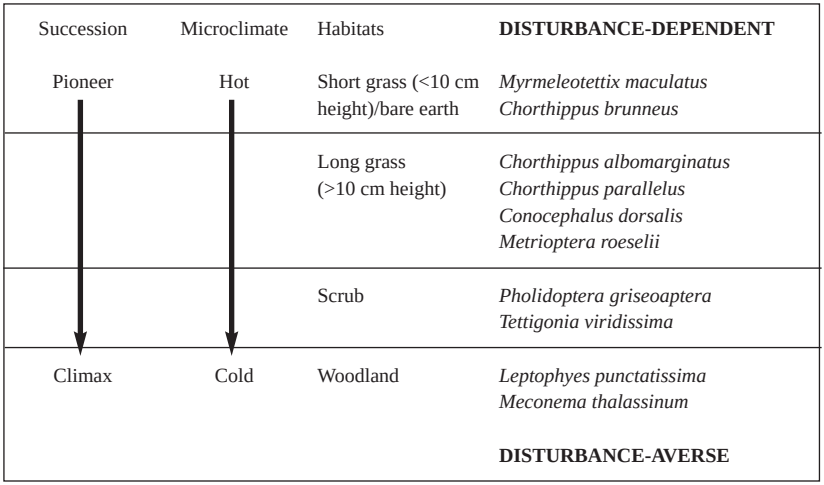
Introduction

The importance of military training areas for insects has been highlighted in a study in Germany (Warren & Büttner, 2009), whereas in the UK, Marren (2002) cheerfully says '*thank goodness for tanks and artillery*' in his New Naturalist guide to Nature Conservation, highlighting how important military areas can be due to their protection from the ravages of intensive agriculture and urban development. From an insect point of view, the value of Friday Wood (OS grid reference: TL 9820) near Colchester in Essex, owned by the Ministry of Defence (MoD), has long been known, particularly for White Admiral *Limenitis camilla* L. and White-letter Hairstreak *Satyrium w-album* Knoch butterflies. However, less well documented are the grasshoppers and bush-crickets (Orthoptera), which can be abundant in areas where military exercises such as rifle firing and tank driving create the necessary habitat conditions for survival.

Warren & Büttner (2009) highlighted that disturbance caused by military activities can help conserve populations of Blue-winged Grasshopper *Oedipoda caerulescens* L., which needs plentiful (30-50%) bare earth in its habitat. Many insects can be classified as either disturbance-dependent or disturbance-averse depending on the level of disturbance of the vegetation cover they need to persist. Bare earth provides sites where grasshoppers can bask to warm up (exposed soil is often much hotter than surrounding vegetation (Key, 2000)) and where adult females of species such as Meadow Grasshopper *Chorthippus parallelus* Zett., which lay their egg pods in exposed soil (Choudhuri, 1958), can deposit their egg load after mating. Bare earth is the earliest stage of succession (Fig. 1), and is often lacking in grasslands due to a dearth of soil disturbance caused by an

absence of grazing livestock or hay cutting with a tractor. Grasslands without management can become tall and rank and have little exposed soil (Ausden & Treweek, 1995).

Figure 1. Level of disturbance-dependence for the 10 Orthoptera species recorded on the Colchester ranges, successional stages, microclimatic temperatures and habitats are shown.



At Friday Wood (90 hectares), four grasshopper (Acrididae) and four bush-cricket (Tettigoniidae) species have been recorded (Table 1), making this a valuable site for Orthoptera in the county (Wake, 1997). Its importance is further enhanced by the presence of Mottled Grasshopper *Myrmeleotettix maculatus* Thunberg, a rare disturbance-dependent insect (Fig. 1) in Essex, found on heathland near to the wood, which has plentiful bare earth. Management by the MoD keeps this area of heathland open and free from scrub encroachment and much Gorse *Ulex europaeus* scrub has been removed in recent years. The habitat of *M. maculatus* is criss-crossed by broad, stony tracks and the un-vegetated ground they use for basking and often for stridulation is mainly the ridges formed on and next to these tracks used by walkers and horse-riders. However, this grasshopper is also found quite a long way from these tracks where the grasses are fine, short and quite sparse. There seems to be a very strong association with carpets of the moss *Polytrichum juniperinum* Hedw. Females have been observed ovipositing by pressing their abdomens down among tufts of the moss.

The ancient woodland is populated by Oak Bush-cricket *Meconema thalassinum* De Geer and Speckled Bush-cricket *Leptophyes punctatissima* Bosc, both disturbance-averse insects that seem to build up large colonies in wooded habitats of considerable age (Fig. 1). Other Orthoptera species found in Friday Wood include Roesel's Bush-cricket *Metrioptera roeselii* Hagenbach and Lesser Marsh Grasshopper *Chorthippus albomarginatus* De Geer, both insects expanding their range in the county due to climate change (Wake, 1997).

Middlewick Ranges (grid ref: TM 0022, area: 41 ha) is one of the best locations for Orthoptera in the county with nine species recorded (four grasshoppers, five bush-crickets; Wake, 1997; Table 1). The firing ranges are inhabited by the Essex Red Data List species (Gardiner & Harvey, 2004) Great Green Bush-cricket *Tettigonia viridissima* L. and *M. maculatus*. What is astonishing about the habitat of *M. maculatus* at the ranges is that this species is found in irregular hollows with hardly any vegetation cover at all (80 – 90% bare earth) behind the main targets. What maintains the habitat in this exposed state is a matter for discussion, but the military usage of the ranges must have some bearing on the abundance of bare earth in addition to motorbike scrambling and occasional fires (deliberately started or otherwise). Heavy vehicular usage would certainly churn up the vegetation and prevent succession to tall grassland and scrub, as would explosions. Such activities are essential for disturbance-dependent insects.

In Essex, there are only seven known sites remaining for *M. maculatus*, of which three have been MoD firing ranges at some time (Gunner's Park in Shoeburyness is now owned by Essex Wildlife Trust, but was formerly a MoD rifle range and has a small colony). The MoD therefore appears to be a champion for this rare grasshopper in the county and helps to clear scrub at the ranges to prevent loss of valuable bare earth. Indeed, a clear policy of the MoD is "*to ensure that natural environment issues are fully integrated with operational and training requirements and safety issues*" (*JSP 362 Chapter 5 Natural Environment (Conservation).* www.mod.uk). The MoD is advised by Colchester Borough Council, Colchester Natural History Society and Natural England in Essex.

The Orthoptera of Middlewick Ranges have fared pretty well compared to the butterflies. Grayling *Hipparchia semele* became extinct at the site in 1991 (Benton & Firmin, 2002). It is suggested by Benton & Firmin that there is a strong correlation between the former sites of *H. semele* and *M. maculatus* in north-east Essex as they prefer similar habitats with patchy vegetation cover.

Field Grasshopper *Chorthippus brunneus* Thunberg is also abundant on the ranges and is another disturbance-dependent insect that requires bare earth in a habitat (Marshall & Haes, 1988) (Fig. 1). The importance of disturbance is illustrated by the abundance of this grasshopper on public footpaths in the Chelmsford area, walkers churning up the soil (Gardiner, 2006). Illegal motorbike usage on footpaths could also create the necessary bare earth to sustain populations of grasshoppers and other invertebrates, despite the nuisance it causes to landowners and walkers. *T. viridissima* (one of the UK's largest insects at 4-5 cm long) is found in scrub on the ranges, as is Dark Bush-cricket *Pholidoptera griseoaptera* De Geer, highlighting the importance of having a diversity of habitats at differing stages of succession to optimise the number of insect species (Fig. 1).

Military management leads to a diversity (heterogeneity) of vegetation cover (e.g. patchy grass and scrub) due to the randomness of explosions and vehicular usage (Warren & Büttner, 2009). Perhaps the only other site to match the

Table 1. Orthoptera species recorded on the three Colchester military training grounds (X indicates presence, * Essex Red Data List species)

Family/species	**Fingringhoe Ranges**	**Friday Wood**	**Middlewick Ranges**
Acrididae (grasshoppers)			
Chorthippus albomarginatus	X	X	X
Chorthippus brunneus	X	X	X
Chorthippus parallelus	X	X	X
*Myrmeleotettix maculatus**		X	X
Tettigoniidae (bush-crickets)			
Conocephalus dorsalis	X		
Leptophyes punctatissima	X	X	X
Meconema thalassinum	X	X	X
Metrioptera roeselii	X	X	X
Pholidoptera griseoaptera		X	X
*Tettigonia viridissima**			X

importance of Middlewick Ranges for Orthoptera in north-east Essex is Colne Point, where *M. maculatus*, Grey Bush-cricket *Platycleis albopunctata* Goeze (as well as Lesser Cockroach *Ectobius panzeri* Stephens) inhabit the sand dunes of this coastal spit. Military activity can also have incidental benefits for Orthoptera; for example, the Field Cricket *Gryllus campestris* L. was probably accidentally introduced onto MoD land near Shoeburyness in 1985 on army equipment from Germany (Wake, 1997). However, extensive searches could not find a breeding colony and this cricket is now thought to be extinct in the county.

Fingringhoe Ranges (grid ref: TM 0318, area: c. 200 ha) have also been thoroughly surveyed for Orthoptera over the years and a total of three grasshopper and four bush-cricket species have been recorded (Table 1). Notably, the long-winged form of Short-winged Conehead *Conocephalus dorsalis* (f. *burri*) Latrielle was recorded in 1983 by Alan Wake on the ranges. Reports of sightings of the long-winged form are particularly rare in the county, the only other sightings occurring in 1984, 2004 and 2007. Fingringhoe Ranges also have large populations of *C. albomarginatus*, *C. parallelus* and *M. roeselii*, all species common in coastal habitats.

Orthoptera are known to be part of the diet of raptorial birds at Fingringhoe Ranges according to pellet analysis conducted by Peter Winter in the 1980s. In correspondence to Alan Wake (previous County Recorder for Orthoptera), he described finding grasshopper remains in the pellets of Kestrels *Falco tinnunculus* L. at the ranges. Peter described the importance of grasshoppers in the diet of raptors as a supplement to small mammal prey such as Harvest Mice

Micromys minutus Pallas and Common Shrews *Sorex araneus* L. at the ranges. The ecological significance of large populations of grasshoppers and bush-crickets as prey for other animals should not be underestimated and they support many food chains (Gardiner & Hassall 2009). In conclusion, the three Colchester ranges support four grasshopper and six bush-cricket species, and have populations of the disturbance-dependent grasshopper, *M. maculatus*, and the disturbance-averse, *T. viridissima* (Fig. 1). The large area of the ranges (Friday Wood 90 ha, Fingringhoe Ranges 200 ha) leads to high connectivity of habitat, which is important for Orthoptera (Warren & Büttner 2009), particularly sedentary grasshoppers such as *M. maculatus*.

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References

Ausden, M. & Treweek, J. 1995. Grasslands, in W.J. Sutherland & D.A. Hill (eds.), *Managing Habitats for Conservation*. Cambridge University Press, Cambridge: 197-229.

Benton, T. & Firmin, J. 2002. *The Butterflies of Colchester and North East Essex*. Colchester Natural History Society, Colchester.

Choudhuri, J.C.B. 1958. Experimental studies on the choice of oviposition sites by two species of *Chorthippus* (Orthoptera: Acrididae). *Journal of Animal Ecology* **27**: 201-215.

Gardiner, T. & Harvey, P. 2004. Red Data List for Essex Orthoptera and Allied Insects. *Bulletin of the Amateur Entomologists' Society* **63**: 19-25.

Gardiner, T. & Hassall, M. 2009. Does microclimate affect grasshopper populations after cutting of hay in improved grassland? *Journal of Insect Conservation* **13**: 97-102.

Gardiner, T. 2006. Insect Highways. *Waymark* **19**: 7-8.

Key, R. 2000. Bare ground and the conservation of invertebrates. *British Wildlife* **11**: 183-191.

Marren, P. 2002. *Nature Conservation*. Harper Collins, London.

Marshall, J.A. & Haes, E.C.M. 1988. *Grasshoppers and Allied Insects of Great Britain and Ireland*. Harley Books, Colchester.

MoD 2004. *JSP 362 Chapter 5 Natural Environment (Conservation)*. www.mod.uk.

Wake, A. 1997. *Grasshoppers and Crickets (Orthoptera) of Essex*. Colchester Natural History Society, Colchester.

Warren, S.D. & Büttner, R. 2009. Active military training areas as refugia for disturbance-dependent endangered insects. *Journal of Insect Conservation* **12**: 671-676.