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BRIEF COMMUNICATION

Pitfall trapping of scarce Orthoptera at a coastal nature reserve in Essex, UK

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Abstract The value of pitfall trapping was questioned in a recent review of methods for sampling Orthoptera in grassland ecosystems. However, subsequent to the publication of this review, interesting data has become available from pitfall trapping at Colne Point, an important coastal nature reserve in Essex, UK. As a result of this trapping, the nationally scarce and Essex Red Data List species, *Platycleis albopunctata*, was rediscovered in the county. This tettigoniid was believed to be extinct in Essex as previous visual searches for the insect at Colne Point had failed to locate it. Large numbers of the Essex Red Data List species, *Myrmeleotettix maculatus*, were also captured, as were specimens of the nationally scarce cockroach, *Ectobius panzeri* (Dictyoptera). Systematic pitfall trapping at Colne Point was therefore pivotal in recording scarce species such as *P. albopunctata* which had proved difficult to locate by visual searching methods.

Keywords Species richness · Orthoptera · Acrididae · Tettigoniidae · Sampling methods · Pitfall traps

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Introduction

In a recent review of the most frequently used methods of sampling Orthoptera abundance in grassland ecosystems (Gardiner et al. 2005), the value of pitfall trapping as a survey technique was questioned. The authors of the review concluded that further validation of the method is needed before the widespread usage of pitfall traps for Orthoptera studies can be recommended. However, there have been some studies using this sampling method; for example, grasshoppers have been captured frequently in pitfall traps in forest ecosystems in the USA (Clayton 2002). In the UK pitfall trapping was conducted in tall, unmanaged pasture and not a single orthopteran was captured (Gardiner and Gouldsmith 2000 unpublished data) which may reflect the low density of the local grasshopper population or the complete inefficiency of the method in tall vegetation. However, since the publication of the review, interesting data from a pitfall trapping experiment at Colne Point, a coastal nature reserve in Essex, UK, has been analysed and it is the aim of this short note to highlight the importance of this sampling method for recording scarce Orthoptera.

Habitats at the reserve

Colne Point is one of the most important areas in Essex for scarce coastal invertebrates, and a substantial number of the species are to be found in only a few other locations in Britain. In an Essex context Colne Point is unique. Although a few other coastal Essex sites have some shingle banks, and several others have comparable tracts of sandy ground, no other location in

the county has such extensive dunes, shingle ridges, the mix of shingle, sand and mud substrates and the gradation of saltmarsh onto these drier habitats. The vegetation cover of large areas is also very important and unique in Essex in an invertebrate context. There are large areas of lichen heath and *Suaeda fruticosa* (which provides a structural habitat very similar to heathland). The east dune is the best dune habitat in Essex, providing a full range of seral stages from fore dune through to stabilised rear dune and dense *Ammophila arenaria*.

Method

In 1990–1991 the first author undertook a survey at the reserve primarily to investigate the spider fauna and to try and refind some of the species first recorded at the site in 1956–1961 by the Flatford Mill Spider Group, later to become the British Arachnological Society. Material in other groups was however retained and later identified. This survey was undertaken using pitfall traps set in four sample areas as well as active field surveys. The locations were chosen to be above normal high tide levels to avoid the flooding of traps and subsequent loss of material. In 2004 the Essex Wildlife Trust commissioned invertebrate surveys on several of their reserves including Colne Point (Harvey 2005).

The survey was repeated in approximately the same locations as 1990–1991, except for traps set in an additional stabilised sand/shingle area between the Jetty Ridge and shore (Area C). Pitfall traps were set at five locations (Areas A–E; Table 1) on the first visit on 17 May 2004, and then collected at approximately 2 week intervals until 17 September, except for a period between 2 June and 2 July when an emergency operation on the first author meant that the survey was delayed until D.A. Smith was able to take over. The traps consisted of polypropylene cups approximately 6 cm in diameter and 10 cm deep which were set into the ground flush with the surface. In each of the trapping locations 5 cups were set at equal distances apart within a 5 m × 5 m area. The trapping locations chosen were open sandy habitats with a vegetation height of less than 10 cm, even if there were areas with taller vegetation or tussocks nearby. The traps contained 30–40% antifreeze and a small amount of detergent.

Results and discussion

A total of six Orthoptera species were recorded in pitfall traps at Colne Point, the most frequently recorded species were *Chorthippus albomarginatus*, *Chorthippus brunneus* and *Myrmeleotettix maculatus* (rare in Essex) (Table 2). Both *M. maculatus* and *C. brunneus* are abundant on sand dunes in the UK (Marshall and Haes 1988) due to their preference for swards with sizeable patches of exposed bare earth that persist amongst the dense stands of *A. arenaria*, whilst *Chorthippus parallelus*, which prefers habitats with lush vegetation over moist soils, is less common and often outnumbered by the former two acridids (Haes and Harding 1997). The relative abundance of species in this study seems to reflect the habitat preferences of grasshoppers which indicates that pitfall trapping may have accurately determined the relative abundance of Orthoptera species in sand dune vegetation (with a high occurrence of bare earth and heterogeneous vegetation height) at Colne Point. Only one species present at Colne Point in previous surveys conducted by visual sighting was not recorded in the pitfall traps (*Conocephalus dorsalis*) suggesting that this method was also fairly accurate in assessing the overall species richness of the site.

Perhaps the most important records from the pitfall trapping were those of *Platycleis albopunctata*, a nationally scarce (Haes and Harding 1997) and Essex Red Data List species (Gardiner and Harvey 2004) that is very rare north of the Thames estuary in the UK

Table 1 Trap locations

Trap location	O.S. grid reference	Description
A	TM107123	Old undisturbed lichen heath next to mostly sparse, open, inland *Ammophila arenaria* and saltmarsh
B	TM110123	Old undisturbed lichen heath next to dense *A. arenaria* and fore dune
C	TM098124	A flat stabilised area of unvegetated or sparsely vegetated sandy shingle between Jetty Ridge and the shore
D	TM098127	Sparsely vegetated area on the side of a shingle ridge (Jetty Ridge) with dense *Carex arenaria* above and an adjacent saltmarsh creek
E	TM096128	A sand dune ridge with open *A. arenaria* between the shingle shore and an extensive area of saltmarsh

Table 2 The total number of Orthoptera captured in pitfall traps at the five recording locations (percentage of total no in brackets)

Orthoptera species	Trapping location					Total
	A	B	C	D	E	
*Myrmeleotettix maculatus**	66	24	8	20	7	125 (49)
Chorthippus albomarginatus	9	5	1	29	11	55 (21)
Chorthippus brunneus	4	1	3	20	17	45 (18)
Chorthippus parallelus	3	2	0	6	17	28 (11)
*Platycleis albopunctata***	0	2	0	0	0	2 (1)
Metrioptera roeselii	0	1	0	0	0	1 (< 1)
Total	82	35	12	75	52	256

* Essex Red Data List species

** Essex Red Data List species and nationally scarce

(Marshall and Haes 1988). According to Gardiner and Harvey (2004) there are three old records in the East Mersea (pre-1896) and St. Osyth (pre-1940) area of Essex. A number of people have searched for the species since without success (Wake 1997), and it was considered probably extinct in the county, and a possibility for reintroduction in the future (Gardiner and Harvey 2004). Previous searches for *P. albopunctata* at Colne Point may have been unsuccessful due to the extremely localised distribution of the species at the site (Table 2) and the tendency of population size to fluctuate largely between years (Gottschalk et al. 2003) which may have led to this species being overlooked by 'ad hoc' visual surveys in years with small populations.

The ineffectiveness of visual searching may also be compounded by the greyish brown colour of *P. albopunctata* adults which provides effective camouflage in tall and dense stands of *A. arenaria* where the proportion of green vegetation is low. Therefore systematic surveys of a site using pitfall traps may be the only option for effectively detecting the presence of small, localised colonies of *P. albopunctata*. However, it must be remembered that pitfall trapping is a highly destructive method of sampling particularly where endangered species are present, therefore regular usage at a site is likely to be detrimental to small, localised populations. Other techniques such as acoustic monitoring may be more applicable for recording endangered species. Gardiner et al. (2005) suggest that acoustic sampling is useful for monitoring rare species that are difficult to detect in the sward due to their cryptic behaviour/colouration. However, the windy climate at Colne Point made it hard to discern the location of stridulating male orthopterans therefore precluding the use of this method at the site.

In conclusion, it would seem that pitfall trapping provided useful data on the Orthoptera assemblage of a coastal nature reserve in Essex, and was pivotal in the rediscovery of the nationally scarce tettigoniid, *P. albopunctata*, which was thought extinct in the county (Gardiner and Harvey 2004). Large numbers of the Essex Red Data species, *M. maculatus*, and the nationally scarce native cockroach, *Ectobius panzeri* (Dictyoptera:Blattellidae), were also captured in pitfall traps at the site in 2004. Further research is required on the accuracy of this sampling technique in estimating the abundance of Orthoptera in habitats such as sand dunes which have a high heterogeneity of vegetation structure and patches of exposed soil.

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