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THE USE OF IMITATION SAND LIZARDS TO ASSESS THE ACCURACY OF VISUAL SURVEYING TECHNIQUES

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Assessment of sand lizard, *Lacerta agilis*, populations is a prerequisite for their conservation and provides a sound basis for management. The problems associated with surveying reptiles are well documented; approaches include mark-recapture, refuges (or cover boards) and direct observation (Gent, 1994; Reading, 1996; Sutherland, 1996).

Direct, or visual, observation is a widely used approach although different methodologies may be adopted. Corbett & Moulton (1996) undertook a comparative study in order to determine the number of lizards observed when using 'directed' and 'straight-line' transects. Experienced surveyors can conduct surveys by a 'directed' transect, defined as " ... a route..., embracing features known to be attractive to reptiles and allowing ease of movement with minimal disturbance to fauna and flora " (Corbett & Moulton, 1996). An alternative approach is to adopt a simple 'straight-line' transect, which is easy to repeat in a standardized manner and can allow those with less experience to undertake surveys. Directed transects are 'biased' in that they are dependent on the preferences of the surveyor, whilst straight line transects avoid this.

This study compares the efficiency of 'directed' and 'straight-line' transects in assessing sand lizard populations when undertaken by surveyors with experience ranging from 'novice' to 'professional'. Surveyors searched for 'populations' of sand lizards, represented by plastic models of adult males, on heathland sites. Models were painted to represent the cryptic colouration described by Stafford (1989) and were of similar size and physical appearance to real lizards.

Transects were located along linear experimental areas which contained features associated with the occurrence of sand lizards. Each model was located in a position representative of sand lizard behaviour (Gent, 1994; NCC, 1983; Prestt, Cooke & Corbett, 1974) in a basking site defined by Inns (1995) as " a pool of sunlight deep in the vegetation or on the sunny edge of dense vegetation ". Surveys were undertaken at three heathland sites supporting reptile populations, selected carefully for similarity, and comprising mature stands of dry heath low scrub (20 to 40 years old), dominated by *Calluna vulgaris* and *Erica cinerea*. The sites had a southerly, south-westerly, or westerly aspect; were unshaded, and had sand features considered attractive to sand lizards. Sites were pre-selected as those considered typical habitats for sand lizards and surveys were conducted under appropriate weather conditions, with temperatures in the range 11 to 18°C during partially sunny or hazy weather with little or no wind (Inns, 1995).

Fifteen surveyors were identified as 'novice', 'experienced' or 'professional' according to their surveying skill, each group containing five surveyors. 'Novice' indicated that surveyors had no prior experience of reptile surveying but, prior to the experiment were briefed on sand lizard behaviour and survey methodology. 'Experienced' surveyors consisted primarily of British Herpetological Society volunteers, and had one or two seasons of surveying experience. 'Professional' surveyors were those with considerable experience of surveying, exceeding two surveying seasons.

Each surveyor was required to walk a 'straight-line' and a 'directed' transect, the order being assigned randomly. In order to allow comparison of the two

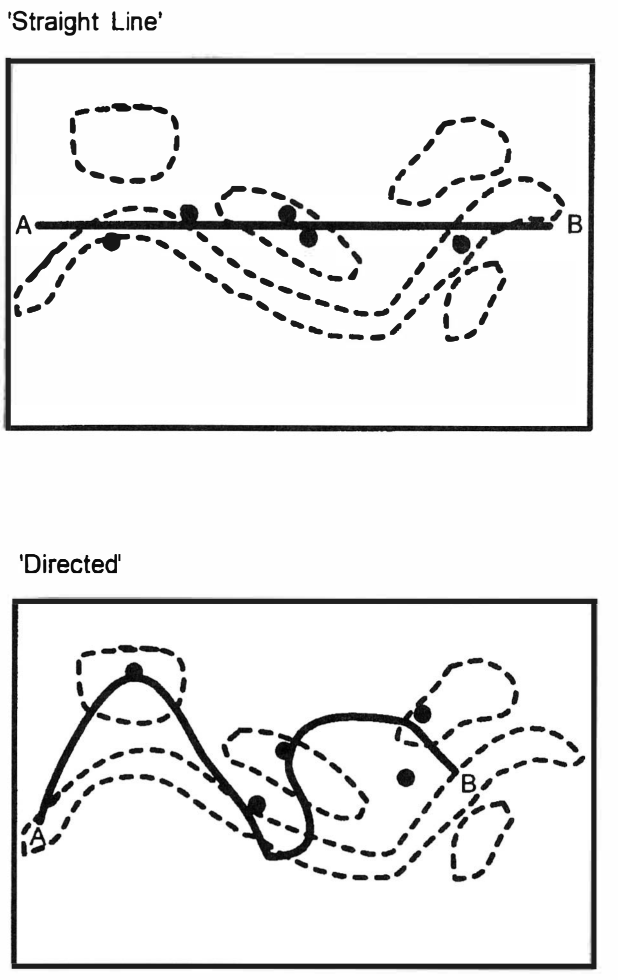

FIG. 1. Schematic diagrams of 'straight line' (visually searching 4 m either side of transect) and 'directed' (unrestricted surveying) transects. The survey area included features such as sandy areas (dotted areas). Models were located so that, in each case, five models could be observed during the 20 min traverse of the transect.

techniques, care was taken to ensure that sampling effort was equal, and was standardized by limiting transect length and restricting the the time taken to conduct each survey to 20 min. Straight-line transects (100 m) were undertaken between two previously marked points (Fig. 1). Each surveyor was instructed to observe any sand lizards sighted within a 4 m band either side of the transect. A directed transect was searched between two points 75 m apart. Surveyors were allowed to deviate from a straight line in order to inspect areas considered to be potential basking sites (Fig. 1).

Five models (to represent a realistic number of individuals) were placed within the boundaries of the transect search areas in basking sites defined above, and surveyors were not aware of the number or location of models. In all cases, a surveyor could have observed all five models in the time given to search each transect.

As well as colouration, cues such as movement and noise may also be used to locate lizards (Inns, 1995). Although this study was designed to assess visual observation, disturbance by the surveyor was also represented and recorded. When a model was observed, surveyors recorded whether the model had been observed within, or beyond, a 2.5 m distance. The distance of 2.5 m was somewhat arbitrary, but was set to represent a proximity which would be likely to cause disturbance of the lizard. The number of sightings from a distance exceeding 2.5 m and the number of total sightings were calculated from each group. Data were analysed by calculating summary statistics and by ANOVA, using a two-factor mixed design with one within subjects factor (Kinnear & Gray, 1994), for both total sightings and sightings exceeding 2.5 m.

Sightings from distances exceeding 2.5m were not significantly different for either method ($F_{1,12}$ = 3.4, P<0.05) or level of expertise ($F_{2,12}$ = 2.7, P<0.05). Inspection of the data indicated no trend for the mean numbers of sightings with respect to expertise for the straight-line transect, whilst the level of expertise appeared to be related to the mean number of sightings for directed transects, although this relationship was non-significant (Fig. 2).

Total sightings were significantly different for both method ($F_{1,12}$ = 19.1, P<0.01) and level of expertise ($F_{2,12}$ = 14.0, P<0.01). A significant interaction between method and the level of expertise was observed ($F_{2,12}$ = 30.4, P<0.01). These results show that whilst the mean number of sightings clearly increased with the level of surveyor experience for the directed method, no pattern was discernible for straight-line transects, indicating that the level of experience did not influence sightings when this methodology was used (Fig. 2).

The proportion of models sighted increased with surveyor expertise from distances exceeding 2.5 m, and total sightings for directed transects, reaching 0.32 and 0.96 respectively for professional surveyors, whilst the proportion of sightings using straight-line transects were with the exception of novice observers generally lower (Fig. 2).

The results demonstrate that data collected from visual surveys is dependent upon both methodology and the level of surveyor expertise. Although five lizards could, in principle, have been seen using either method, numbers recorded using the directed transects were higher than those recorded using the straight-line transect for experienced and professional surveyors, whilst the reverse was true for novices. This suggests that surveyors with experience are able to use their understanding of reptile behaviour to locate areas likely to have lizards present with directed transects. However, lizards were placed in locations considered to be attractive and so this result is unsurprising. Novices were poor at surveying using directed methodology for this very reason; they did not have the expertise to find these 'preferred' locations. However, when the straight-line transect was adopted, results were not demonstrably dependent on expertise. Directed transects, therefore may maximize sightings when undertaken by expert surveyors, but straight-line transects have the benefit of not being expertise-dependent and thus not subject to bias. Directed transects are useful in terms of assessing presence/absence when undertaken by experienced surveyors, whereas straight-line transects are a standardized, repeatable technique which is expertise-independent and can be used to demonstrate, for example, annual changes in numbers more effectively than the directed methodology.

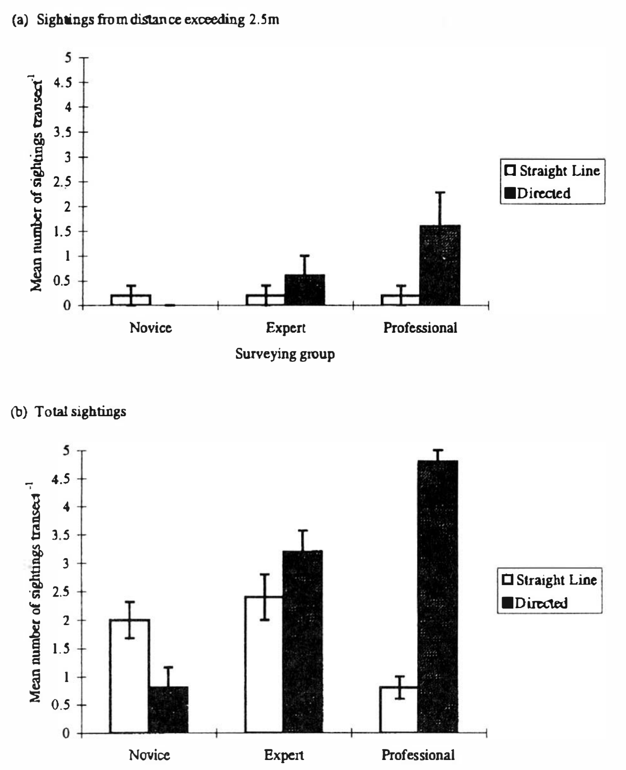

FIG. 2. Mean number of sightings (±SE) of sand lizard models by surveyors of novice, expert and professional experience using straight line and directed transects.

The positioning of straight line transects needs careful consideration. Repeated transects located at random may be used to estimate density (Buckland *et al.*, 1993), whilst if transect location is pre-determined as in this study, features suitable for sand lizards may be included. If surveying is undertaken by those with little experience, adequate surveying may be possible with appropriate guidance and training if a pre-marked route is set out by an experienced herpetologist (N. Moulton, pers. comm.). Other considerations may also influence the type of methodology adopted. Corbett & Tamarind (1979) stated that rigid adherence to straight-line transects could cause damage to dense heathland stands which may lead to changes in the successional status of heath (Burden & Randerson, 1972). However, straight-line transect methodology could include some allowance for deviation from the line in order to reduce damage.

The proximity to lizards is an important factor influencing efficiency. Although the distance of 2.5 m was arbitrary, it does suggest that factors such as disturbance or a surveyor's inability to spot lizards at a distance could compromise the survey results; professional surveyors were 96% efficient for total counts, but only 32% efficient for sightings at a distance exceeding 2.5 m. Any standardized methodology should account for factors such as disturbance, particularly if it is anticipated that the method will be adopted by beginners (the novice group, using directed transects, were unable to locate any lizards at a distance exceeding 2.5 m, and only 16% in total). By retreating and then returning after 10 to 15 mins, a lizard may return to its basking position following disturbance and so a standardized methodology could include surveyors returning to features. Stealth and a good field-eye are required because of the mobility, shyness and cryptic colouration of this species (Sutherland, 1996).

The use of plastic models allows a degree of quantification which is difficult to obtain when observing real lizard populations. The advantage of this approach is that repeat surveys are possible; it is known that each surveyor will encounter the same distribution and number of 'lizards'. This study, however, assumed that the locations of lizards expected by herpetologists truly represents their distribution and further study would be needed to investigate the effects of expertise and transect type fully. Further study could locate lizards randomly within search areas to determine whether the ability of experienced surveyors to locate lizards is due to a refined 'search image' or whether they simply are able to locate 'suitable' sites. The methodology could also be extended to other reptiles and could, perhaps, be developed to compare survey efficiency under different habitat types and prevailing weather conditions, or the efficiency of sighting lizards when these are located within different habitat features.

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REFERENCES

Buckland, S. T., Anderson, D. R., Burnham, K. P. & Laake, J. L. (1993). *Distance Sampling: Estimating Abundance of Biological Populations.* Chapman and Hall, London.

Burden, R. F. & Randerson, P. F. (1972). Quantitative studies on the effects of human trampling on vegetation as an aid to the management of semi-natural areas. *Journal of Applied Ecology*, **9**, 439-57.

Corbett, K. F. & Moulton, N. (1996). *Sand Lizard Species Recovery Programme Project: 2nd Year Report (1995-96).* English Nature Research Report No. 187, Peterborough.

Corbett, K. F. & Tamarind, D. (1979). Conservation of the sand lizard (*Lacerta agilis*) by habitat management. *British Journal of Herpetology*, **5**, 799-823.

Gent, A. (1994). Survey and Monitoring of Reptiles. In: *Species Conservation Handbook.* English Nature, Peterborough.

Inns, H. (1995). *Survey Methodology for British Reptiles.* British Herpetological Society. Unpublished Report.

Kinnear, P. R. & Gray, D. G. (1994). *SPSS for Windows Made Simple.* Lawrence Erlbaum Associates, Hove.

NCC (1983). *The Ecology and Conservation of Amphibian and Reptile Species Endangered in Britain.* Nature Conservancy Council, Peterborough.

Prestt, I., Cooke, A. S. & Corbett, K. F. (1974). British Amphibians and Reptiles. In: *The Changing Flora and Fauna of Britain*, ed. D. L. Hawksworth. Academic Press, London.

Reading, C. J. (1996). *Evaluation of Reptile Survey Methodologies.* English Nature Research Report No. 200. English Nature, Peterborough.

Stafford, P. (1989). *Lizards of the British Isles.* Shire Natural History, Aylesbury.

Sutherland, W. J. (1996). *Ecological Census Techniques: A Handbook.* Cambridge University Press.

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