13. Survey and Monitoring

13.1. Reptile surveys for habitat management

Reptile survey is a key step in management planning and assessment. For the site manager, the most common objectives for a reptile survey are:

- To determine if a given species is present on site.
- To establish which areas of a site are currently of high value for reptiles.
- To assess the impacts of habitat management, by monitoring reptile habitat use, breeding success, population size, and/or habitat condition.
- To produce recommendations on the potential for expanding or linking reptile populations.
- To assess the suitability of a site to support a (re-) introduced reptile population.
- To assess the impact of potentially negative factors such as arson or disturbance.

Detailed methods for reptile survey are given in full in other publications (Foster and Gent, 1996; Gent and Gibson, 1998; Froglife, 1999), and only a brief guide is given here. The methods necessary will obviously depend on the survey objective.

13.2. Reptile survey methods

The two most frequently used methods are visual searches and refuge surveys, which are most effective when used in combination. Visual searches (sometimes called 'visual encounter surveys') require inspecting likely habitat (see *4. Habitat Requirements*) under suitable weather conditions. The most effective time to search is when reptiles are basking. Reptiles bask between air temperatures of approximately 10-20ºC, but there are complex variations due to species, season, age and habitat. For example, viviparous lizards and adders are commonly observed at lower temperatures than grass snakes, sometimes less than 10ºC in early spring. Adult grass snakes are more frequently found than juveniles by visual searches.

Visual searches are most effective in the early spring, shortly after emergence from hibernation. At this time vegetation cover is minimal and reptiles spend a lot of time basking in preparation for breeding. Spring time visual surveys are an excellent means of locating communal hibernation sites. At other times of the year they are useful only for the legged lizards. Smooth snakes and slow-worms are invariably only found under refuges, so visual searches are almost worthless for these species.

Refuge surveys exploit the reptilian attraction to warm microhabitats created under objects lying on the ground, heated by the sun. Objects specifically placed to attract reptiles for survey purposes are commonly referred to as survey refuges or cover objects. Materials vary in their effectiveness and practicality (see table below).

Checking under a sheet of weathered corrugated iron during a refuge survey (Peter Stafford)

Summary of advantages/disadvantages of commonly used refuge materials

Refuge material	Advantages	Disadvantages
Corrugated Iron	Very attractive to reptiles Discarded sheets sometimes available	Heavy Difficult to cut to size Risk of injury from sharp edges
Roofing felt	Cheap Easily cut to size Portable	Not always effective for snakes Not very durable Eaten by livestock
Coroline/Onduline	Attractive to reptiles Light	Available in limited sizes Difficult to cut to size

Opposite: Slow-worms under roofing felt (ARC)

Corrugated iron or 'tin' (rusty seems better than new) and roofing felt are commonly used by reptile surveyors. Corrugated bitumen-based roofing sheets (Coroline or Onduline) have been used recently and show some promise. Wooden boards, carpet tiles and rubber floor mats from cars have also been used. The differing thermal properties of the refuge materials affect their attractiveness to reptiles. Relative attractiveness seems to alter under differing environmental conditions. For example, corrugated iron generally tends to be more attractive than roofing felt – yet at the tail end of the survey season, when the sun is lower in the sky, roofing felt seems to retain heat more readily than corrugated iron and hence attracts more reptiles. It is clear from research that corrugated iron is more attractive than roofing felt to snakes, though for most management purposes the difference may not be critical.

Larger refuges tend to attract more reptiles than small ones, so use the largest size that is practical to handle and which can be rapidly searched under when lifted. Care should be exercised on adder sites as surveyors have been bitten when lifting refuges.

Refuges should be placed at locations likely to be used by reptiles, for example in tussocky grassland, or along the base of a sunny hedgerow. They are best placed by pressing them down on to herbaceous vegetation, which allows a greater range of microclimate and humidity to be created underneath than if the refuge were placed on bare ground, for example.

Reptiles may find refuges very quickly on sites with high population densities. There is some evidence that refuges are more attractive to reptiles if they are left to 'bed in' for several weeks. At low population densities, it can take weeks or months for animals to start using refuges.

The use of refuges on sites prone to public disturbance requires caution. Reptiles under refuges may be more prone to collection by, or harm from, other site users. Further, sharp-edged corrugated iron refuges can pose a danger to livestock, dogs or people and must either be sited appropriately, or safer alternatives used.

On some sites a surveyor may be able to use refuges already in place, such as fallen road signs on verges or discarded corrugated iron on farmland or other discarded material almost anywhere.

Other survey methods include searching for grass snake eggs (see *9.3 Grass snake egg-laying heaps*), and searching for sand lizard egg (or test) burrows. The latter requires considerable experience and has a very limited window of opportunity. The shed skins (sloughs) of reptiles are sometimes found during surveys. The scale patterns and pigmentation can be used to identify species (e.g. see Inns, 2009).

Locations are best recorded using a global positioning system (GPS) unit. GPS units can also be useful for recording the locations of the refuges themselves on sites where seasonal vegetation growth can make it difficult to relocate them. Additional survey information that may be useful includes:

- Date.
- Time.
- Weather conditions.
- Reptile behaviour.
- Habitat and microhabitat.

Refuges can attract other, non-reptilian, species of conservation interest, for example glow-worm larvae and water shrews.

GPS data can be plotted on large-scale maps and aerial photographs using a geographic information system (GIS). The resulting maps can be used in planning habitat management (see *5. Principles and Planning*).

Reptiles can be difficult to find, so lack of detection during a survey visit does not necessarily imply their absence. Repeated visits (seven or so is recommended for most site management purposes) are needed to be fairly sure that lack of detection equates to absence. However, the effort required varies in a complex way, depending largely on population size and habitat type. A small population of smooth snakes, for example, can take tens of visits over months or even years to detect. Adders and grass snakes may use a particular area for only part of the year, so to evaluate site use by these species, survey visits should be spread over the course of the reptiles' active season. A very high level of effort to conclude absence would be needed if there were a proposal to reintroduce, since it would be most unwise to release animals into an existing population.

13.3. Monitoring reptile populations

Ideally, reptile population size at a site would be used to determine the conservation status of species and changes therein could be tracked over time. Unfortunately, there are no reliable means of relating the numbers of animals recorded in typical surveys to actual population size. The most reliable method of estimating population size is a capture-mark-recapture (CMR) study. This method suffers from the drawback that it can be time consuming, especially on larger sites, or when multiple sites are being monitored. It also requires repeated disturbance.

Hence, counts of reptiles seen during repeatable surveys (e.g. walking a defined transect in a set time, and/or comparing captures per refuge set) are often the best option for site managers. Results can be expressed as encounter rates (number of animals observed per hour, or per visit if this is standardised). This can provide a population index for a particular site that may allow trends to be tracked over time.

Interpreting trends in counts is further complicated by the fact that changes in habitat often alter reptile detectability (effectively, how easy it is to observe a reptile). A common example involves scrub clearance. This can render reptiles more visible shortly after the operation. As a result, survey counts can increase immediately following management. This increase in counts is probably not, however, due to any actual population increase. UK reptile populations generally do not fluctuate dramatically within one year (unlike with some amphibians, where this is common), as their reproductive biology does not allow this. Major differences in survey counts obtained over a space of months or low numbers of years are more likely due to differences in detectability. This could, in turn, be due to habitat management making snakes more visible, or perhaps because a survey was done in more favourable weather conditions. Similarly, lower counts need not necessarily indicate a declining population; they may occur simply because the animals are less easy to locate, or because they have moved outside the survey area. Hence, count data should be interpreted cautiously, using all contextual information, and ideally collected over at least five years to allow proper assessment.

CMR studies remove the problems associated with detectability, but are more labour intensive. A useful addition to count surveys is to record the presence of breeding. This can be based on finding neonates or hatchlings in late summer, and (for sand lizard) egg burrows in late spring.

13.4. Monitoring reptile habitats

In addition to studying the reptile populations themselves, it is also recommended to monitor the extent and condition of their habitats. This is particularly useful for informing management decisions as it highlights key reptile areas and other important features, such as hibernacula, that are not always obvious on the ground.

The crucial point here is that monitoring should relate to management objectives. So, for instance, monitoring may record progress towards creating a mosaic of uneven-aged swards, or a rough grass margin around a pond.

Mapping reptile habitats and potential habitats with GIS is invaluable, especially since they may change over time due to management, succession and events such as fires. Fixed point photography, taken in the same season each year, can be extremely valuable. It is also important to determine the value of these areas in a wider context and this will facilitate landscape scale management. An experienced reptile surveyor can identify areas of potential habitat, based on factors such as geology, aspect, vegetation type and historical records.

13.5. National survey projects

Several schemes are now underway in Britain that will add enormously to our knowledge of reptile distribution, conservation status, habitat use and management requirements. The National Amphibian and Reptile Recording Scheme (NARRS) is an umbrella for various monitoring projects (see *14. Sources of Information and Advice* for more details). Site managers are encouraged to contribute to relevant projects.