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Reptile Presence/Likely-absence Survey

**Report Prepared on behalf of Pagham Beach (Holdings) Ltd
For the site of Land to the east of 29 Harbour Road, Pagham, Bognor Regis, Sussex. PO21.**

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Reptile Survey

Background to Survey

The client, Pagham Beach (Holdings) Ltd has commissioned Arbtech Consulting Ltd. to undertake a Reptile Presence/Likely-absence¹ Survey for 'Land to the east of 29 Harbour Road, Pagham, Bognor Regis, Sussex. PO21.' The proposed plans involve developing part of land currently used to store boats.

Summary of Recommendations

If the survey determines that there is a likely-absence of reptiles it is likely that no further evaluation will be necessary to achieve planning determination. However if it is assessed that reptiles are present on site or within the zone-of-influence of the proposals then further scientific investigation may be required and it is likely that some form of mitigation will need to be offered. Furthermore planning authorities are now under an obligation to seek enhancements (positive improvements) for biodiversity through the planning system.

A presence of common species of reptile; slow worms and common lizards, has been assessed as present on site or within the zone-of-influence of the proposals. It will be necessary to develop a suitable mitigation scheme to ensure that reptiles are not killed or injured as a result of the proposals; in compliance with statutory wildlife legislation.

¹ "Likely-absence". It is not currently scientifically possible to prove an absence. The phrase "likely-absence" is used to mean an assessed absence that has been tested to a reasonable scientific standard.

1.0 The Company and Contact Information

Established in 2005, Arbtech Consulting Limited provides arboricultural and ecological consultancy services in respect to planning and development, throughout the UK.

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2.0 The Surveyor

The surveyor and principal author of this report is Natalie Evans HND, BA (hons), MA.

3.0 Protected Species Licenses

Not applicable

4.0 The Client

The client is Pagham Beach (Holdings) Ltd

5.0 The Site of Proposed Development

The client is preparing a planning application for property development on 'Land to the east of 29 Harbour Road, Pagham, Bognor Regis, Sussex. PO21'.

6.0 The Survey Brief

The client commissioned Arbtech Consulting Ltd to undertake a reptile presence/likely-absence survey in accordance with current best practice guidelines . The aim of the survey was to confirm presence/likely absence of reptiles within the survey area. This report makes recommendations to minimise the risk of killing and injury, and ensure that the client is compliant with domestic wildlife legislation (The Wildlife and Countryside Act).

7.0 Limitations

This survey provides a 'snap-shot' of the habitat conditions and ecology of the site at the time of surveys only, and the site/project may require further survey effort to provide robust, scientifically valid evidence of habitat conditions and species population status.

Common practice dictates that most planning authorities will accept a survey report that is less than two years old (from the date of the field survey). Older reports are likely to require repeat surveys and a report update. Also, if there has been a material change to the site since these surveys were undertaken, a refresher survey is likely to be necessary.

8.0 Data Searches

A 2km Data Search was carried out by Sussex Biodiversity Records Centre in 2014. The records are now out of date and a new set of reptile records will be required in order to inform the full mitigation plan which will be drawn up prior to the start of development.

9.0 Survey dates and conditions

This survey was conducted on 22nd, 29th June, 6th, 17th, 23rd and 31st July and the 7th and 10th August and was not constrained by adverse weather conditions (in accordance with Froglife, 1999).

Table 1: Summary of Weather Conditions is shown below:

Date	Low/High Temp (°C)	Wind/ Beaufort	Rain
22/06/15 set up (1030)	13/14	1	Yes
29/06/15 (0700)	12/13.5	2	None
06/07/15 (0700)	10/12	1	None
17/07/15 (0730)	17/18	2	None
23/07/15 (1900)	17/18	1	None
31/07/15 (1900)	17/18	1	None
07/08/2015 (0740)	17/18	0	None
10/08/2015 (0730)	16/17.5	1	None

10.0 Seasonality

The optimal timing windows for a reptile presence/likely-absence survey are April - May and September, however given optimal weather conditions surveys may be conducted at any point from April to October (the normal survey window).

This survey was conducted in suitable weather conditions within the normal survey window.

11.0 Informative

Legislation

There are six native reptile species in the UK. Four of these are relatively more common (the 'widespread' species) - the common lizard *Zootoca vivipara*; slow-worm *Anguis fragilis*; adder *Vipera berus* and grass snake *Natrix natrix*. These species enjoy limited protection under the Wildlife and Countryside Act 1981 by virtue of subsections 9(1) and 9(5) and as such are protected against killing and injury.

The two rarer native reptiles in the UK are the sand lizard *Lacerta agilis* and the smooth snake *Coronella austriaca*. These species are European Protected Species and are subject to further protection under the Conservation Regulations.

A summary of legislation relevant to individual species can be found at Appendix I.

12.0 The Survey Methodology

Surveys were carried out in line with Froglife Advice Sheet 10 (Froglife, 1999) and Gent and Gibson, 1998. A combination of checks of artificial refugia and standard walked transects were used to assess the presence/likely-absence of reptiles on the site. These refuges can act as a place to shelter from predation and disturbance, and as an aid to absorbing heat. Roofing felt traps heat and provides an opportunity for animals to warm up without exposing themselves to obvious danger. Artificial refuges can sometimes act as reptile “magnets”, attracting animals from the immediate vicinity, and can be a useful aid to survey if placed on the site carefully. (Froglife, 1999)

Artificial refugia were deployed to the site (the extent of the site is shown in Figure 1.1) to encourage any reptiles present to bask on top, or shelter underneath, thereby increasing the chances of observation by the surveyor. Refuges were positioned around the boundaries of the site due to the ongoing use of the site as a boat yard. With boats coming in and out, the refuges had to be placed where they would not be in danger of being run over. The habitat around the boundaries of the site also presented the best habitat on site with grassland and areas of dense scrub. The refugia consisted of 25 x 0.5m² roofing felt sheets (‘felts’)

The refugia were set out on the 22nd June, seven days before survey work commenced. The refugia locations were recorded by a GPS and mapped.

Refugia were checked by an experienced field-ecologist who observed from a distance (to record any animals basking on top) and then lifted up the sheets. Seven visits were made (evening checks conducted between 1800 and 2000 and morning checks between 0600 and 0800).

All reptiles found on or under the felts were recorded, and sexed where possible. Whilst travelling between the refugia, fixed transects were followed. Any areas of shelter within 2m of the centre line of the transects were checked. Any basking reptiles were also recorded.

Figure 1.1: View of the site - showing refugia layout:



14.0 Survey Results

The site was subject to a preliminary ecological appraisal (PEA) by Arbtech Consulting Ltd on 2nd January 2014. Scrub and grassland habitat are present on site, particularly around the boundaries. There are records of slow worms, grass snakes, common lizards and adders within 2km of the site.

Table 2.1: Positive Reptile sightings

Felt No	29/06/15 (0700) - Av 13C Cloudy, dry	06/07/15 (0700) - Av 15C Sunny spells, damp	17/07/15 (0730) - Av 17.5C cloudy, dry	23/07/15 (1900) - Av 17.5C sunny spells, dry	31/07/15 (1900) - Av 17.5C sunny, dry	07/08/15 (0740) - Av 17.5C Sunny, dry	10/08/15 (0730) - Av 16.5C cloudy. damp
4	nil	nil	nil	nil	nil	nil	1 adult F slow worm
7	nil	nil	nil	1 adult F common lizard	nil	nil	nil
11	1 adult F slow worm	nil	nil	nil	nil	nil	nil
17	nil	nil	nil	nil	nil	2 adult F slow worms	1 adult F slow worm
19	nil	nil	nil	nil	nil	nil	1 adult F + 1 juv slow worm

Female adult slow worms were found under felts along the north, east, west and south-west boundaries. These were not found in densities greater than three females and one juvenile per survey. One female adult common lizard was found under a felt at the northern boundary.



Adult and juvenile slow worms under felt 19.



Common lizard under felt 7.

Table 3: Summary of Results and likely Impacts

Reptile Species concerned	Potential impact/loss?
Adder	Likely absence
Grass Snake	Likely-absence
Slow Worm	Adult and juvenile slow worms present around site boundaries. The site will be developed for housing therefore habitat will be lost. Slow worms could be injured or killed.
Common Lizard	Common lizard present around site boundaries. The site will be developed for housing therefore habitat will be lost. This species could be injured or killed.

15.0 Conclusions and Recommendations

The survey was conducted under good survey conditions and was not constrained.

A maximum of four slow worms and one common lizard was found on each visit; both species are confirmed as present in suitable habitat on the site. However, a population estimate cannot be made based on this survey effort; a further 13 visits will be required immediately prior to the mitigation described below, to inform habitat creation/enhancement, and the minimum translocation effort required.

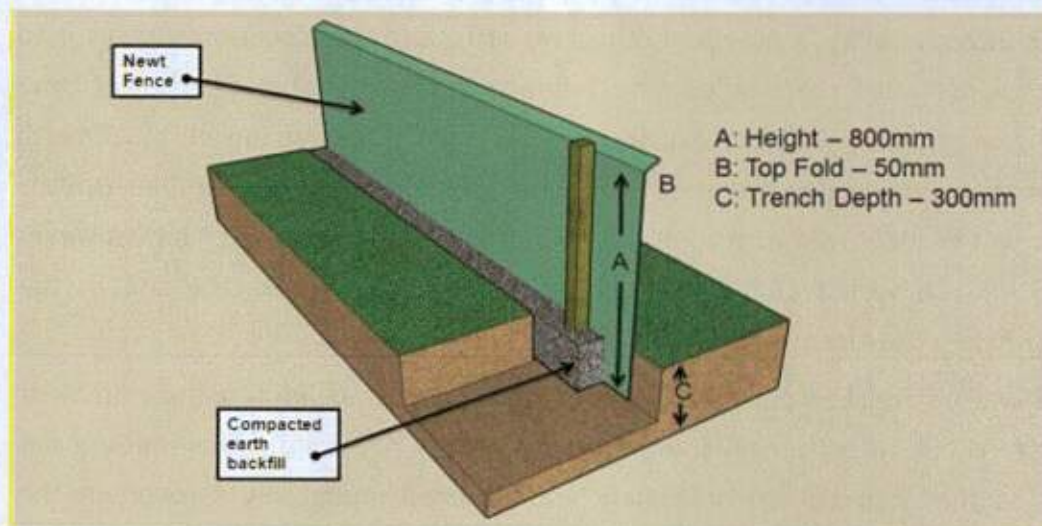
Reasonable precautions will need to be taken to minimise the risk of killing or injury to reptiles arising from the proposed development of the site - and most particularly throughout the construction period.

The proposals will result in the loss of available reptile habitat- however the gardens and landscaping areas that are proposed may allow for the continued presence of a small reptile population.

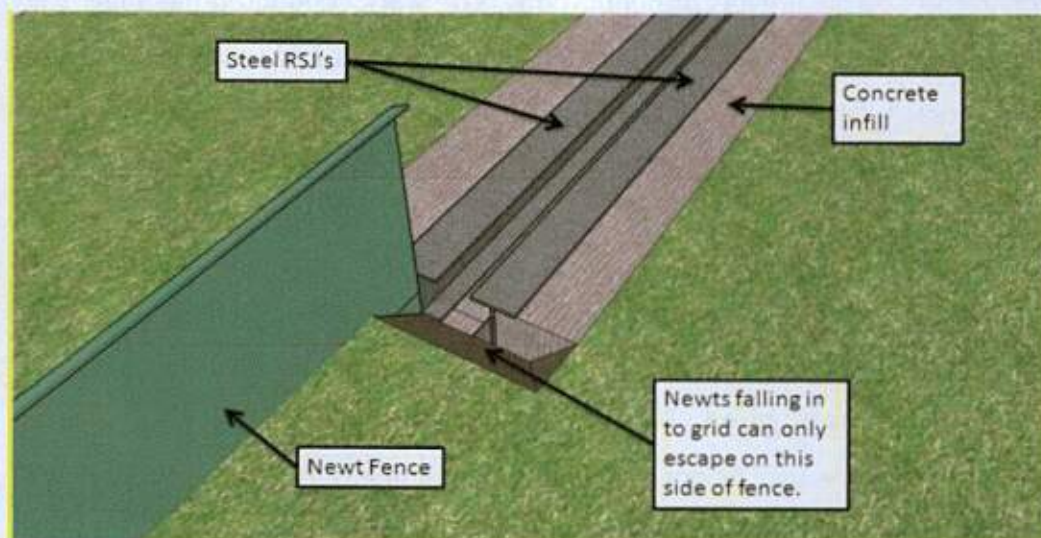
In order to develop the site it will be necessary to ensure that reptiles within the construction footprint are not killed or injured. The normal methodology to ensure this would be to seal the construction footprint with herptile fencing and remove the reptile population by systematic trapping and translocation to a receptor area either elsewhere on site or off-site. A mitigation plan will need to be drawn up as a condition of planning. This will include detailed procedures around what needs to be done before, during and after development. It will include details of a receptor site where reptiles can be moved to, and long term enhancements to sustain a reptile population both on the site itself and the receptor site.

The semi-permanent reptile fence consists of a 1x850mm sheet of recycled HDPE plastic. In normal ground conditions, the plastic is buried to a depth of 200mm. The plastic sheet is scored 100mm in from the base to allow for the creation of a 100mm underground return. Alternatively the plastic can be buried vertically to 300mm with no underground return. The plastic sheet is semi rigid so requires support. In normal ground conditions this is provided by 50x50x1000mm tanalised timber stakes. The sheet is fixed to the stakes using 35mm screws (3 No. per post). The plastic is scored 50mm in from the top edge. This allows for folding and the creation of an overhang

to further prevent the passage of reptiles. See following drawing of herptile fence installation:



Where access is required into the trapping area, a herptile grid shall be installed to allow the free passage of vehicles. This consists of two 5metre RSJs set into a concrete beam with a gap between them. Exit points are provided at the end of the grids to allow any animals that fall into the void between the two RSJs to escape. See following drawing of a herptile grid.



The following translocation methodology will be used:

Reptiles can often be found under debris that is exposed, or partially exposed, to the sun (Gent & Gibson, 1998). A practical objective of reptile translocation surveys is to find them basking, when there is least disturbance to the animal and sufficient time to capture the animal. Refugia (squares of corrugated tin [painted black with "hammerite" paint or roofing felt sheets) will be placed in areas of suitable habitat. The refugia will be deployed at an initial density of 10 "tins/felts" per ha. However this density will be varied and adjusted to maximise catch across the site as the experience of the conditions at the site increases.

The refugia will be checked periodically in suitable weather conditions (low ambient air temperature but with the sun shining, and little, or no, wind). This method has advantages as they can be left stationary and checked repeatedly throughout the translocation period, they can be surveyed in cloudy weather and they will be used by reptiles through the warmer months of the summer.

A "reasonable effort" must be expended in order for the client to be able to comply with the statutory obligations and planning conditions with respect to protecting common reptile species upon the site.

Existing guidelines suggest a trapping effort of between 2 months and 2 years depending upon the assessed levels of populations. The work conducted has suggested generally low-level populations of reptiles at the site along the site boundaries.

The current proposal is to trap areas for 30 "good" (i.e. where weather conditions are favourable) days and then for as many trapping days as are necessary to achieve 5 clear days where no animals are captured.

A running record of species caught with some basic animal data (size, sex, weight etc.) will be kept throughout the works. This data will be supplied in a trapping report and annual monitoring report that will be produced for the Local Authority and Natural England Teams, as required.

At this site it is considered sufficient to remove the animals from the construction area, over the herptile fence, and to simply allow them to disperse into the

17.0 Document Production and Approval Record

Status	Issue	Surveyor	Date
Draft	1	Natalie Evans	12/08/15
Reviewed	1	Julie Powell	18/08/2015
Final	1	Natalie Evans	20/08/15
Updated	2	Natalie Evans	21/08/15

18.0 Limitations

Arbtech Consulting Ltd has prepared this report for the sole use of the above named Client or his agents in accordance with our General Terms and Conditions, under which our services are performed. It is expressly stated that no other warranty, expressed or implied, is made as to the professional advice included in this Report or any other services provided by us. This report may not be relied upon by any other party without the prior and express written agreement of Arbtech Consulting Limited. The assessments made assume that the sites and facilities will continue to be used for their current purpose without significant change. The conclusions and recommendations contained in this report may be based in part or whole upon information provided by third parties, which has not been independently verified by Arbtech Consulting Limited.

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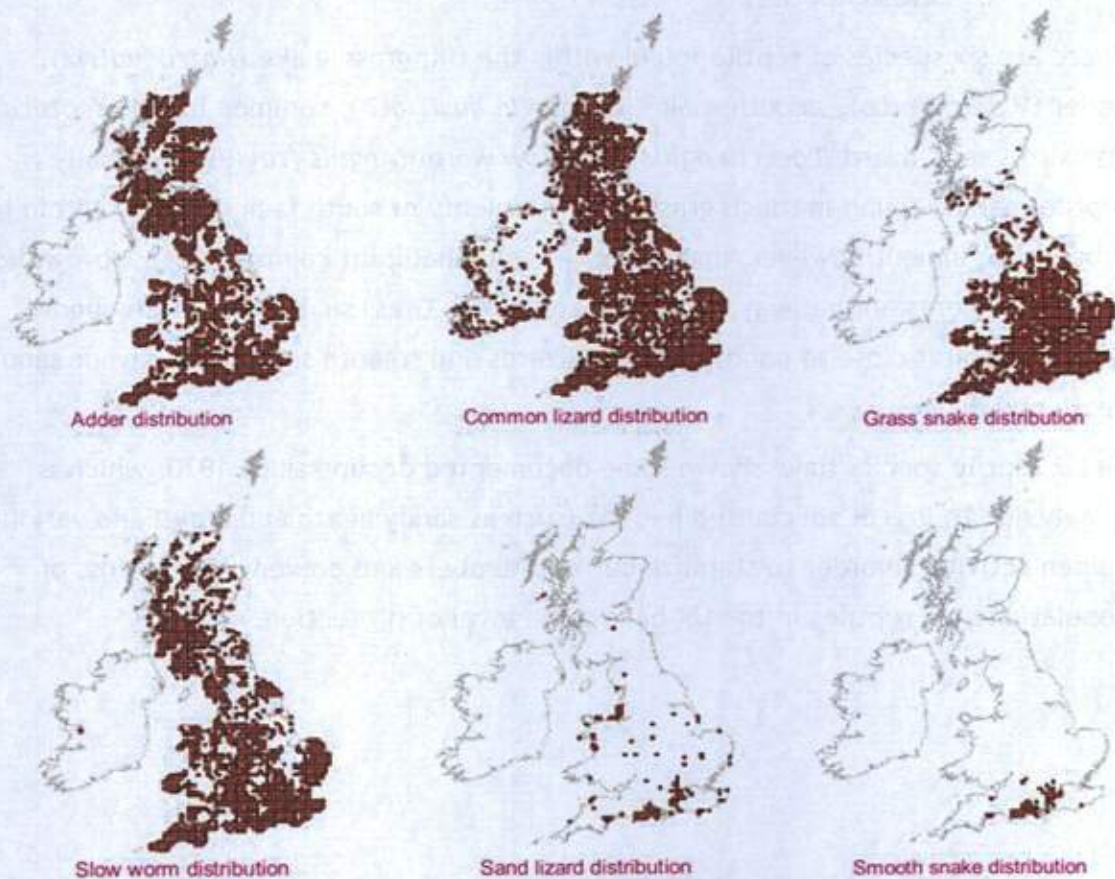
Appendix I: British Reptiles and Legislation

i. British Reptiles

There are six species of reptile found within the UK; grass snake (*Natrix natrix*), adder (*Vipera berus*), smooth snake (*Coronella austriaca*), common lizard (*Zootoca vivipara*), sand lizard (*Lacerta agilis*) and slow worm (*Anguis fragilis*). Typically reptiles can be found in rough grassland with plenty of south facing banks. Within the urban environment however, many reptiles will inhabit compost heaps, brownfield sites, allotments and railway roads/embankments. Grass snakes will often choose wetland habitat close to ponds and sand lizards and smooth snakes will favour sandy heath and dune.

All six reptile species have shown some documented decline since 1970, which is largely due to loss of specialised habitat (such as sandy heath and dune) and various human activity. In order to stabilize current numbers and prevent further loss of populations, all reptiles in the UK have some level of protection.

Figure 1: Known distribution of British Reptiles.



Source: National Biodiversity Network
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Appendix 1 - British Reptiles and Legislation cont.

ii. The Legislation

The Wildlife and Countryside Act 1981 (as amended) and the *Wildlife (NI) Order 1985*, protects all native British reptiles from deliberate killing and injury.

Additionally, *The Wildlife and Countryside Act 1981* (as amended) and Schedule 2 of the *Conservation of Habitats and Species Regulations 2010* (as amended) provide additional protection for the smooth snake and sand lizard by making it against the law to:

- *deliberately or intentionally kill, capture or injure sand lizards and smooth snakes*
- *deliberately or intentionally or recklessly* disturb sand lizards and smooth snakes*
- *deliberately or intentionally or recklessly* damage, destroy or obstruct a breeding site, resting place or other place used for shelter and protection*
- *take or destroy eggs*
- *keep, sell or exchange sand lizards or smooth snakes (or their eggs)*

*For England and Wales, the term recklessly was added as an amendment to *The Wildlife and Countryside Act 1981* as a result of the CRow Act 2000.

In England, Scotland and Wales, slow-worm, common lizard, adder and grass snake are also protected against killing, injury and sale, barter or exchange, but their habitats or places of shelter are not specifically protected.

All above legislation applies to all stages of life of reptiles e.g. eggs, juveniles etc.

Additionally any animal captured is protected by the UK animal welfare laws which prevent cruelty and abandonment.

The sand lizard is protected by the UK Biodiversity Action Plan and the smooth snake is included in English Nature's species recovery programme.

Local Biodiversity Action Plans may include any or all of the 6 reptile species.

Appendix 2 - Licensing

i. England, Scotland and Wales

A European Protected Species development license (issued under Regulation 53(2)(e) of the Conservation of Habitats and Species Regulations 2010) must be sort by a developer and/or landowner prior to any activity which is likely to:

1. Result in the deliberate capture, injury or killing of a smooth snake or sand lizard,
2. Result in the deliberate disturbance* of smooth snakes or sand lizards,
3. Damage or destroy a breeding site or resting place used by smooth snakes or sand lizards.

**Disturbance to animals includes any particular disturbance which is likely too:*

a. Impair their ability too

- i. Survive, breed, reproduce or rear or nurture their young; or*
- ii. In the case of animals of hibernating or migratory species, to hibernate or migrate:*

or

- iii. Affect significantly the local distribution of abundance of the species to which they belong.*

These licences will only be made available to those suitably qualified individuals and additionally will require the completion of relevant surveys and mitigation plans.

Licences are not required for undertaking surveys or mitigation for common lizard, slow-worm, grass snake or adder.

ii. Northern Ireland

The common lizard is classed as a priority species here and therefore proof of appropriate surveys and mitigation is required in those instances where development

could affect the animals or their environment. Put simply, evidence must be provided that all reasonable effort has been made to avoid breaking the law.

There is no provision for the Statutory Nature Conservation Organisation (SNCO) to issue a licence. Environment and Heritage Service (Natural Heritage) must be consulted to clarify if a conservation licence is in order.



Appendix II: Reptile Identification

Reptile Identification

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Viviparous lizard

Adults 13-15 cm. Coloration and markings variable. Background coloration generally brown.

Males often have a flecked pattern on back.

Some have few markings, being solid brown or black.

Females often have stripes on back.

Males have thicker base to tail and brighter, speckled underside.

Newborn young are dark in colour, almost black, 4 cm.

Occasionally green, leading to mistaken identification as sand lizard.



Sand lizard

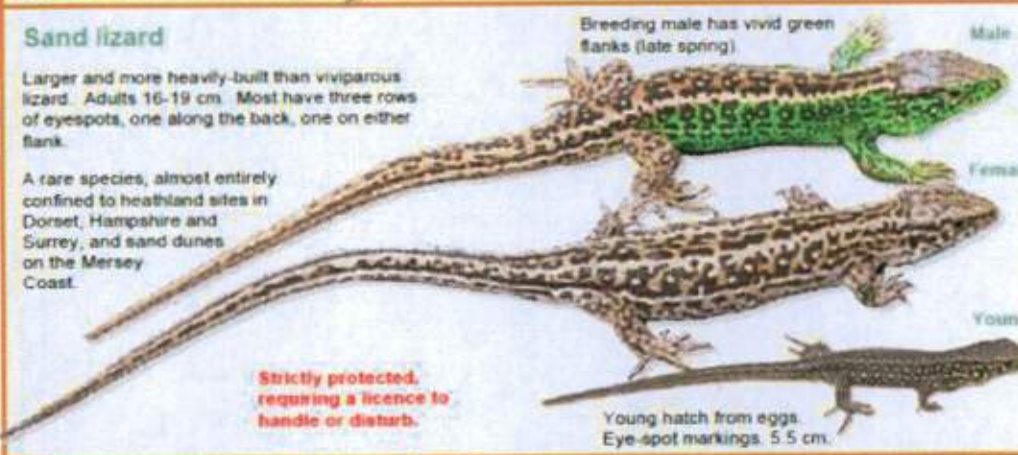
Larger and more heavily-built than viviparous lizard. Adults 16-19 cm. Most have three rows of eyespots, one along the back, one on either flank.

A rare species, almost entirely confined to heathland sites in Dorset, Hampshire and Surrey, and sand dunes on the Mersey Coast.

Breeding male has vivid green flanks (late spring).

Young hatch from eggs. Eye-spot markings 5.5 cm.

Strictly protected, requiring a licence to handle or disturb.

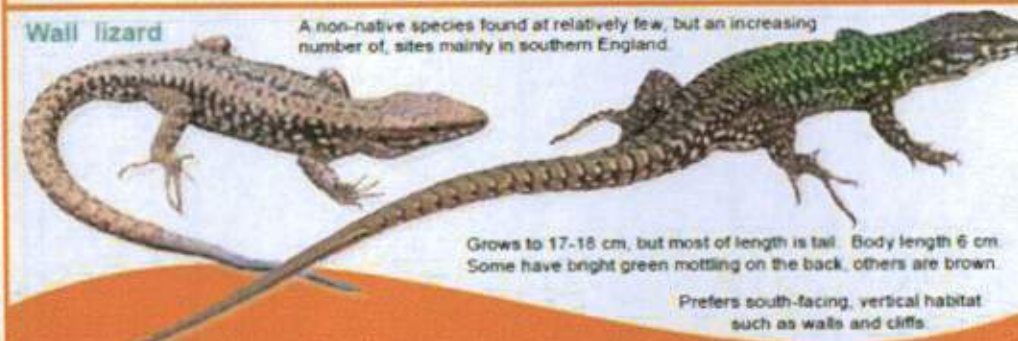


Wall lizard

A non-native species found at relatively few, but an increasing number of, sites mainly in southern England.

Grows to 17-18 cm, but most of length is tail. Body length 6 cm. Some have bright green mottling on the back, others are brown.

Prefers south-facing, vertical habitat such as walls and cliffs.

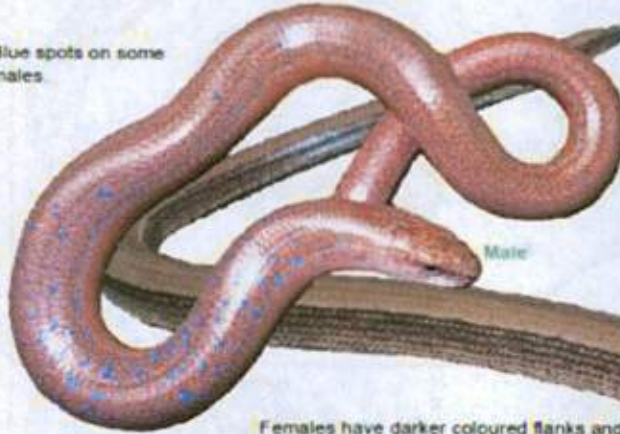


Slow-worm

Adults 35-40 cm. Generally grey or brown, very rarely black. Small, shiny scales, giving a metallic appearance.

The most common reptile in the UK, found in a variety of habitats, including gardens. Spends most of its time underground or in vegetation litter. Most likely to be found underneath objects lying on the ground, or in compost heaps.

Blue spots on some males.



Male



New-born 7-10 cm, usually with a black spot on the head.

Female

Females have darker coloured flanks and often a black line running along the back.

Grass snake

Adults 70-100 cm, occasionally some females growing larger.

Cream, yellow or white collar behind the head, bordered to the rear by black marks.



Body colour ranges from bright green to dark olive, but mostly the latter. Darker specimens can appear black from a distance. Truly black grass snakes are rare.



Most have black bars on the flanks, some also have black spots on the back.



Eggs 2.5 cm long. Laid in clutches of 10-40, usually stuck together. Several females may leave eggs in the same place (usually in decomposing material such as a compost or manure heap).

May pretend to be dead as defensive behaviour. Note chequered black markings on pale underside.



Hatched eggshells. These are very persistent and may remain up to a year after hatching.

Hatchlings 16-20 cm with similar markings to adults. Appear late August to September.

Smooth snake

Restricted to heathlands in Dorset, Hampshire and Surrey. Males predominately brown, females grey. Dark butterfly shape on top of head. Pairs of spots, sometimes fused as bars, running along back. Black line running through eye.

Female



Grows to 45-55 cm, slender.
Strictly protected, requiring a licence to handle or disturb.

Male



Young 14-16 cm, resemble adults but with better defined markings.

Adder

A stocky snake, adults 40-70 cm.

Female



Wide distribution, but restricted to specific habitats (heathland, down, scrub, woodland edge, road and rail embankments).

Male



Variable coloration. Males typically grey with a black zigzag stripe, females generally brown with a dark brown zigzag stripe.

New-born 16 cm. Some young are brick-red, others have similar coloration to adults.



Young



Black adders are found in some areas.

Head profiles

Slow-worm



Grass snake



Pale collar

Smooth snake



Line through eye

Adder



Vertical pupil

Many species of snake are kept as pets and so escaped or released non-native snakes are occasionally encountered.

Reptile sloughs

Reptiles periodically shed (slough) their skins, to allow for growth and to replace ageing tissue. The shed (sloughed) skins can be useful in identifying species.

Lizards Skin sloughed in fragments, often much smaller than shown here.



Viviparous lizard (left) Sand lizard (right)

Dorsal (back) patterning evident. Small, bead-like scales on back. Large scales on ventral surface (underside) – but single scales not spanning the width of the body.

Slow-worm

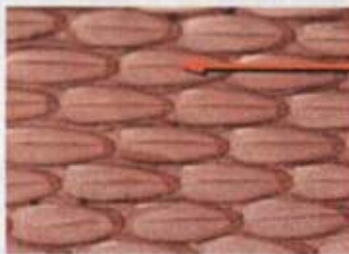
Fragments of skin may be rolled up, like a removed sock.



Uniformly sized scales on dorsal and ventral surfaces.

Snakes

Large ventral scales (underneath), spanning the width of the body.



Grass snake

- Keel on dorsal scales.
- Divided anal/pre-anal scale.
- Large plates on head (e.g. behind eye).



Underside of grass snake

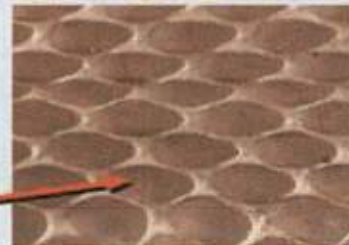
Adder

- Dorsal zigzag pattern usually visible, especially when viewed on light background.
- Keel on dorsal scales.
- Large plates, but also small scales, on head (e.g. behind eye).
- Undivided anal/pre-anal scale.



Smooth snake

- No obvious markings on slough and no keel on dorsal scales.



Sexing snakes

Male snakes have relatively longer tails than do females – hence males have more ventral tail (sub-caudal) scales. These can be counted on sloughed skins.

Adder		Grass snake		Smooth snake		Source: Bebbin, TJC and Griffiths, JA (2001). <i>Amphibians and Reptiles: A Natural History of the British Herpetofauna</i> . The New Naturalist Library.
Male	Female	Male	Female	Male	Female	
32-46	24-38	61-73	49-64	50-64	43-57	

Further information Howard Inns (2009). *Britain's Reptiles and Amphibians*. WILDGuides

Amphibian and Reptile Conservation & Fred Holmes (2013).
Revised with financial assistance from Natural England
Amphibian and Reptile Conservation www.arc-bnnt.org

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Appendix III Site Photos



Figure 1: felts along the south west boundary.



Figure 2: felts along the north east boundary.



Figure 2: felts along the north west boundary.



Figure 3: northern corner of the site.

Appendix IV - Methodology and Mitigation

i. Methodology

There are inherent problems when surveying reptiles and so the techniques employed must take into account the specific traits of these animals.

1. Energetic, but reticent creatures which do not cluster for mating.
2. Heavily dictated by weather conditions.

Surveys should involve a combination of artificial refugia and visual searching as the former alone are not ideal for all species.

ii. Measurable Characteristics

Evaluation of these indicators enables species assessment on a specific site.

1. Population Size: The time period for this activity is April-October using 'mark-recapture' as any other method will be less precise.
2. Breeding Success: This is determined by counting the juveniles joining the breeding group annually.
3. Survival and Mortality: Can only consistently be measured by mark-recapture techniques and undertaken by the appraisal of the survival of uniquely marked animals between occurrences of trapping. To be certain that a population has been affected by death or emigration dead animals must be found. Containment is vital as birth and immigration is often confused.

iii. Types of Methodology

There are four basic types of survey used for reptiles.

1. Artificial Refugia
2. Standard Walked Transects or Visual Searching
3. Trapping
4. Mark-Recapture

1. Artificial Refugia

Sheets of metal or roofing felt are used as artificial shelters which attract reptiles to them as which warm up naturally in the sun. This is especially so for slow-worms which are often found under naturally occurring refuges such as logs but other species of lizard and snake will also utilise such shelters as basking sites, in particular, sand and common lizards.

These are checked in early morning or evening by turning the refugia and identifying any individuals resting beneath. Refugia laid out in a grid format can be used to estimate the density or a population in addition to presence which can be helpful in those areas where searching for naturally occurring shelters is difficult and time consuming. Distances between refuges can be identified as transects for logging purposes (see later for Standard Walked Transects.) Such artificial shelters are carefully hidden to prevent disturbance or collection by unauthorised persons. Reptile surveys are highly weather dependant and should only be undertaken in optimal weather conditions to avoid an inaccurate representation of the population.

Standard Survey Requirements

As a principle, there should 5-10 refuges per hectare, placed as close as possible, to randomly selected pieces of ground with suitable vegetation (*Froglife 1999*). Land with inappropriate vegetation should be avoided. The numbered and labelled sheets should be camouflaged but exposed to the sun. Ideally they should be removed at the end of the survey and should not remain in place for more than 3 seasons. If unauthorised tampering is suspected they should be removed or relocated (*Griffiths & Inns, 1998*).

Monitoring

Refuges are best set-up during winter prior to the reptiles emerging from hibernation in the spring. Later set-up can return errors in a survey due to the possibility that some refugia will remain undiscovered.

The site should be monitored between April and October, (the optimal months being April, May and September). The best months should be the focus of attention (*Gibson & Gibson, 1998*). A minimum of 7 visits is recommended, in appropriate weather conditions i.e. warm and sunny but not hot with little rain and wind, as well as the time of year to determine presence/absence. (*Froglife, 1999*) Optimum weather conditions for observations vary with species. The ideal conditions for most species are 11-19 °C, with periods of sunshine and cool nights with minimum precipitation and between the hours of 6-8 am and 6-8pm.

Data Analysis and Interpretation

Standard Walk Transects

A transect is a path along which is recorded occurrences of flora or fauna. The observer moves along a specified path, counting the occurrences of reptiles and, noting the distance of an animal from the path. To enable density calculation of a species in a given area. They can be more intensively searched by studying cover within a specified distance of the transect line which will increase observation number. This technique is used for all reptiles, (except slow worms) which commonly bask during sunny periods. This method can be combined with the use of other techniques but particularly with Artificial Refugia. This method is the best option for surveying species that are less likely to be found under refugia e.g. grass snake, common lizard and sand lizard.

Field Methods

Reptiles are not easy to spot. The observer moves slowly, back to the sun, focussing on basking spots, out of shadow and as far into the distance as possible. They are extremely shy and will disperse if disturbed but often soon return to their chosen spot if the observer retreats and remains still. Log piles, stumps, the bottom of dry stone walls, and patches of open ground among heather should be carefully studied. Snakes, in particular, are frequently found on the periphery of a habitat or away from direct sun under bushes and shrubs.

Weather and Time of Year

Common lizards will be observed at the beginning of March when temperatures are between 9- 18°C when the sun is out. Pregnant females will also bask in June and July and so August and September are the optimum months to observe hatchlings. Slow-worms are rarely seen in the open but have basking characteristics similar to the common lizard. Sand lizards are very elusive and should be studied between April and September when hatchlings can be seen. Adders will emerge relatively early from hibernation and frequently bask together in temperatures between 8 - 16°C near their place of hibernation. Surveying can start in March as adders are less tolerant of high temperatures than other reptiles.

Data Analysis and Interpretation

Sightings per hour can be used to measure abundance and therefore site comparisons and between years if standardisation and sampling is used. Typically, in optimum ideal conditions only one fifth to one third of the total population is observable on a transect (*Gent, 1994*). This method is useful for obtaining adult and juvenile populations and can indicate breeding success between years.

Trapping

This is undertaken using a combination of pitfall traps and drift fencing to enhance effectiveness. The former are holes in the ground into which an animal falls and cannot escape. These consist of either glass, plastic or metal container, sunk into the soil so that the mouth is level with the soil surface. They should be placed along areas, where they are most likely to be encountered by the animals to be trapped.

Drift fencing is a long continuous barrier so when the animals come upon the fence they move along it looking for an opening. It allows them to be more easily captured when many small species are most active and hard to observe. This method can be used to determine presence. Fences are useful for excluding species from an area but not particularly useful for population surveys. Traps are less suitable than refugia or transects as the animals are left vulnerable to predation and extremes of heat.

Field Methods

Traps are placed in warm and open areas but covered with a raised lid to shade and reduce anxiety to the animal. They must be checked repeatedly during the day. To prevent predation or exposure, cover needs to also be provided and captives should not be left in traps overnight and the lid fitted when not in use. The traps are set-up in a grid formation as per refugia or placed along the edges of the habitat.

Data Analysis and Interpretation

Trapping data is best used with a mark-recapture study allowing a more accurate calculation of abundance plus other population considerations. Additionally, direct comparisons can be made between data obtained between different occasions. This is an important factor as reptile densities are often low, the intrinsic fluctuation in data can make prediction of trends inaccurate and so results need standardising for comparative purposes and traps should be positioned in representative habitat.

Mark-recapture

This is the only technique that allows for production of sufficient data for accurate population size to be assessed. Animals are trapped using one of the techniques listed, marked to enable future identification and then released. Subsequent trapping will reveal the ratio of new captures to recaptures and is used to estimate the total population size. This technique can provide other population

characteristics such as births, deaths, immigration and emigration. The mark chosen depends on whether individual recognition is required or only batch marking.

Field Methods

Capture

Reptiles can be caught with traps or by hand during the checking of refugia (tinning) or transect surveys. Catching by hand is difficult and should only be undertaken if absolutely necessary. Handling of reptiles, especially Adders, must be undertaken by trained individual as it is critical to avoid damage to the animal. Slow-worms are held firmly but not tightly between the head and body. Common Lizards should be caught by holding the whole of the head and body supporting it with the hand. All lizards will drop their tails if mishandled and should never be caught in this way, especially in warm weather, which can be damaging. Slow-worms in particular, are not able to fully regrow their tails if this occurs. On capture reptiles will writhe about and slow-worms and grass snakes may defaecate. With lizards, the handler must be calm by supporting the animal in the hand. Where adders are involved, surveyors must work in pairs in case of adder bites which can be serious but rarely fatal.

Marking

A PIT (Passive Integrated Responder) tag can be used which is a radio frequency device, with no internal battery, that transmits a unique individual code to a reader. The reader powers the PIT via radio frequency induction and receives the code back from the tag. Advantages are this form of identification does not require line of sight, and tags are readable as long as they are within range. Reptiles can be marked with paint such as nail varnish which is temporary and does not hurt the animal but could make it easier to spot by prey. The actual markings can be used avoiding the need for artificial marking such as chin spots for slow-worms and head markings for all snake species and is the preferred method. The markings are drawn onto prepared blank sketches or photographs of the individual taken whilst in a transparent container.

Mitigation

Where the effect of development cannot be avoided then mitigation will be required and is directly dependent on the form and size of the impact. Each case must be assessed on its merits and therefore the mitigation must be appropriate to the impact caused in conjunction with a consultant. Such plans must be agreed with the relevant SNCO and may include the purchase or allocation of land, creation of habitat, capture, exclusion and translocation of reptiles as necessary plus post development monitoring and habitat management. A development licence must be obtained if required. Additionally, the timing of mitigation must take into consideration any other protected species

Translocation

A last resort this is only considered if the loss of habitat is completely unavoidable due to the time and investment involved and is not always particularly successful. Therefore the granting of a development licence where translocation of sand lizards or smooth snakes are involved are highly unlikely in England and Wales. Bearing in mind the legislation, the minimum requirement in a situation where habitat loss is completely unavoidable, is that any reptile on the development site must be excluded, by the use of trapping and fencing in the optimum time of the year, and moved to an alternative site before ground clearance can begin. The minimum time that must be allowed to catch all reptiles is from 60 suitable* days upward depending on population number. However, where the animal number is of real significance then this period may extend to 2 years plus. If scrub management is undertaken early in the year to prevent birds nesting then efforts must be made to avoid affecting hibernating reptiles.

*Suitable refers to weather conditions which allow the animals to be caught by hand or using artificial refugia.

After Development Commences

If animals are found on the site after work has begun then all works must stop immediately since, with reference to the legislation, killing or injuring any species of British reptile is against the law.

Penalties

Companies and/or individuals may be held liable and offences are punishable by up to £5000.00 maximum for each offence committed. Furthermore, prison sentences of up to 6 months are possible and all vehicles involved in the offences may be required to be surrendered. The level of punishment is dictated by the specific law broken. Penalties can higher if dealt with by a Crown Court.

Positive Impacts

Positive Outcomes Post Development

As a result of development and with small additions, reptile habitats can be improved as part of the landscaping works:

1. South facing banks for basking can be created from excavated rock or soil,
2. Sheltering spots can be fashioned from clearance debris such as rock and log piles,
3. Scrub and grassland can be formed by planting.

Bibliography

Froglife Advice 'Sheet 10' Reptile Survey. An introduction to planning, conducting + interpreting surveys for snake + lizard conservation.

Office of the Deputy Prime Minister (2005). Circular 06/2005: Biodiversity and Geological Conservation. Para.99

Office of the Deputy Prime Minister (2005a). Planning Policy Statement 9: Biodiversity and Geological Conservation. London: HMSO.

Paul Edgar, Jim Foster and John Baker (2010). Reptile Habitat Management Handbook. Amphibian and Reptile Conservation, Bournemouth

Betts, C. (2002). Checklist of Protected British Species. 2nd edition. Environmental Biology, Worcester.

Blomberg, S. and Shine, R. (1996), 'Reptiles'. IN: Sutherland, W. J. (ed). Ecological Census Techniques: a handbook. Cambridge University Press, Cambridge.

English Nature. (2004). Reptiles: guidelines for developers. English Nature, Peterborough.

Gent, T. and Gibson, S. (2003). Herpetofauna Worker's Manual - Second Edition, Joint Nature Conservation Committee, Peterborough.

The Highways Agency, Scottish Executive, Welsh Assembly Government and The Department For Regional Development. (2005). 'Design Manual For Roads And Bridges: Nature Conservation Advice in Relation to Reptiles and Roads'.

National Amphibian and Reptile Recording Scheme Reptile Methods and Protocols. <http://www.narrs.org.uk>

National Biodiversity Network. (2014). <http://www.searchnbn.net/>

Natural England. (2010). Document entitled: 'Reptile Mitigation - CONSULTATION DRAFT 26 January 2010: Herpetofauna Worker's Meeting 2010 Workshop - Reptile mitigation guidance'.

Wildlife & Countryside Act (1981) As Amended.

UK BAP. (2012). UK Biodiversity Action Plan. <http://www.ukbap.org.uk/>

Appendix V - 2km Data Search Records from Sussex Biodiversity Records Centre (remove before placing this report in any public forum, register, or display).

There are records of slow worms, grass snakes, common lizards and adders within 2km of the site.

Full records were obtained for the purposes of the phase 1 habitat survey by Arbtech Consulting Ltd in January 2014. Up to date records will need to be acquired to inform the mitigation plan prior to the start of the development.

