



Surveying for (Great Crested) Newt Conservation

Why survey for great crested newts?

The great crested newt *Triturus cristatus* is strictly protected in Britain where the main cause of decline is loss of habitat, particularly breeding ponds. These may be deliberately filled in or disappear during the course of natural succession. A major aim in great crested newt conservation is to prevent this loss, and identification of breeding sites is a first step in this process. In brief, identifying great crested newt breeding sites helps to conserve them.

The habitat of great crested newts is legally protected. However, of an estimated 18,000 breeding sites, the majority (perhaps as many as 80%) remains unrecorded. Hence many sites are lost in spite of the newts' presence.

On the other hand, if ponds are surveyed, great crested newt records can be passed to regional recorders and record centres and then relayed to the appropriate authorities. Sites may be designated as County Wildlife Sites or exceptionally as Sites of Special Scientific Interest (SSSI). If records are made available to local authorities then great crested newt habitat can be protected during the strategic planning and development control processes. As sites are identified, their locations and assessment of management needs can be used to produce plans for local pond restoration and creation. Landowners can be informed of the presence of this species and provided with advice on habitat management.

Although the primary focus of these guidelines is the great crested newt, survey methods are generally applicable to the other two native species, palmate and smooth newt (also referred to in this advice sheet as the smaller newts). These guidelines will help in considering a range of survey strategies, and in selecting from a variety of survey techniques. The techniques considered are refuge searching, egg searching, netting, torching and bottle trapping.

These guidelines are intended for conservation survey work. Guidelines and standards for survey as part of licensed mitigation, resulting from development threats, are provided in *Great Crested Newt Mitigation Guidelines* available from English Nature.

Planning a survey

All survey records are useful. However, with a little planning the beneficial results of a survey can be maximised. A surveyor should consider the aims of the survey. Are they to locate new site records for great crested newts, or to measure the number and density of ponds occupied by newts in a locality, or to quantify the change in status of newts within a given area or pond?

The section on *Survey strategy*, below, is intended to guide surveyors through these questions.

Surveyors should also do some research to establish previous, or even ongoing, surveys in the same geographic area. This could avoid replication of effort and may allow collaboration with others. Local Amphibian and Reptile Groups (ARGs), Wildlife Trusts or natural history societies may be able to provide information on other surveys. FrogLife can help in making local contacts.

Before survey work is carried out the permission of landowners should always be obtained. Great crested newt survey work will also require licensing.

Survey strategy

For the purposes of this advice sheet, survey strategy refers to the way in which ponds are selected for survey. The choice of strategy will depend on the aims of the survey.

Incidental survey

This refers to surveying ponds on an opportunistic basis. Incidental surveys may cover hundreds of records gathered over a long period or a single record generated for any purpose, such as someone looking for newts in their garden pond, the field pond next door, or at a site threatened by development.

Targeted survey

Targeted surveys focus effort on ponds that are purposely, rather than opportunistically, selected. For example a

recorder trying to maximise the number of great crested newt site records that can be made in a limited time could focus on ponds thought most likely to support this species. Clues as to the likely presence or absence of great crested newts can be obtained by inspecting the habitat and on the basis of other species present. For example, a pond that supports large numbers of fish and ducks is an unlikely great crested newt site.

Great crested newts may occupy clusters of ponds (as metapopulations) so a search aimed solely at locating new site records could concentrate on ponds close to sites where populations are known to exist. 1:25,000, or finer, resolution Ordnance Survey maps are useful for locating ponds. If re-surveying an area in which information on the distribution of great crested newts is old and very patchy, it is best to concentrate on checking positive historical sites, then spread out effort to look at ponds within 500 m or so. This will check whether 'old' sites are still occupied, and give an idea of whether they are part of metapopulations.

Targeted surveys are the best strategy to produce a large number of new records, but are limited with respect to provision of a complete picture. For example, they cannot be used to provide precise information on average local pond occupancies (the proportion of ponds occupied by newts) because they are based on a sample of ponds likely to support a higher than average number of newt populations.

Blanket survey

Blanket surveys cover all ponds within a given area, for example a parish, district or grid square of an Ordnance Survey map. The size of the area will depend on the resources available and pond density. These detailed surveys can provide complete information on newt distribution and density of breeding sites, which can be useful even beyond the area surveyed. For example if a blanket survey reveals that about one third of local ponds can be expected to support great crested newts then this can influence planning and land management decisions, even if the actual ponds have not been surveyed.

What data should I collect?

Presence/likely absence

For most conservation surveys, the key information to gather is whether newts are present or absent. Theoretically, it is impossible to prove that newts are absent from a site. Just because you cannot find newts does not mean that they are not there. However, in practice it is useful to be able to record animals as absent, or strictly speaking, likely to be absent. Several visits and a variety of survey techniques (see below) will be required before it can be concluded that newts are likely to be absent from a site.

Relative abundance

Although presence/likely absence surveys are the basis of much great crested newt conservation work there are

situations where it is helpful or necessary to obtain some measure of population size. However, establishing the true size of a newt population is very time-consuming – it is an activity more appropriate to research projects than to conservation work and hence is not addressed in this advice sheet. Relative abundance is a more practical option for conservation surveys. Relative abundance is the number of newts seen or captured using repeatable methods, allowing comparisons to be made between sites or over time. It can be used to:

- **assess sites for conservation designation**
- **compare sites when developing and prioritising conservation strategies**
- **consider population changes over time.**

A simple system to evaluate populations, based on counts of newts seen or netted, is provided in the guidelines for the selection of biological SSSIs published by the Nature Conservancy Council in 1989 (reproduced in the *Herpetofauna Workers' Manual* [see *Further reading*]). Newt populations are scored as low, good or exceptional (Table 1). To be eligible for SSSI designation a great crested newt population has to be scored as exceptional over at least three years.

The surveyor should be aware of the limitations of this system. Night-time counts can vary dramatically for a single population from one day to the next and in particular are affected by temperature fluctuations. Also, the variable nature of ponds affects the ease with which newts can be seen. Newts may be less easily observed in turbid or weedy ponds. Repeating the counting process can go some way towards compensating for variation in newt visibility in a pond. At least three, and preferably six, counts are recommended. These should be carried out over the course of the main breeding season, under suitable weather conditions. The highest count obtained can be used to score the population. The average count should be used to compare between sites, or over time. When assessing populations in a closely-spaced group of ponds (within 250 m of each other) counts can be added together to give a total site score.

A more involved method of measuring relative abundance, based on newts seen, netted or trapped per two metres of shoreline, is given in Griffiths *et al.* (1996).

If monitoring (measuring relative abundance or population size changes over time) is being undertaken, it should be noted that newt population size can fluctuate between years, sometimes quite dramatically. This is not necessarily a cause for concern, but may be quite a normal state of affairs. Long-term monitoring, ideally over many years, is needed to reveal any meaningful population trends.

Licensing

The great crested newt is strictly protected in Britain through the Wildlife and Countryside Act 1981 (as amended) and the Conservation (Natural Habitats etc.) Regulations 1994. This legislation not only protects great crested newt habitat, but also makes it an offence to capture or disturb the species. A licence allows an otherwise unlawful activity to occur for a certain reason, such as conservation. The survey techniques described below involve capture and/or disturbance, so a licence is required to carry them out legally. Licences are issued by the relevant statutory nature conservation organisation - see the section on *Advice and assistance* for contact details. Surveys for palmate and smooth newts do not require licences.

Survey techniques

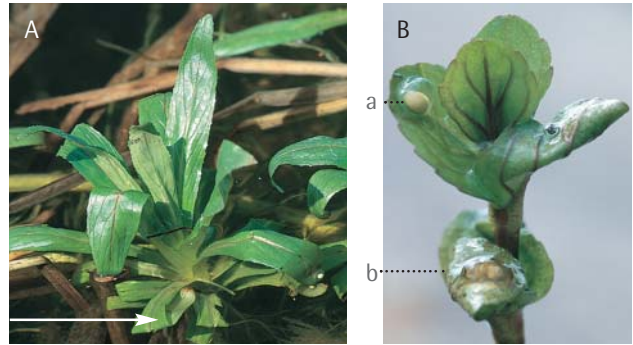
The techniques used will depend on both the level of information needed and the nature of the pond. If a survey is to provide results that will be compared with other surveys, then the techniques used must be the same in all cases. For example if a survey aims to look at changes in local populations by re-visiting sites of old records, then the survey techniques should be the same as used in the original work.

Refuge searching

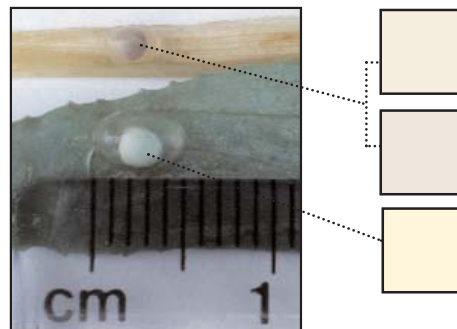
On land newts take refuge beneath objects such as rocks, logs, moss, and discarded debris, particularly if they retain moisture. Looking underneath such objects, especially in the vicinity of ponds, can sometimes reveal newts. Juvenile and adult newts may be found under refuges from March to October. However, refuge searching is often not very effective; newts may be present at a site, but simply not found under refuges. This method is best used as an additional technique when undertaking other survey methods. All materials moved should be replaced in their original positions.

Egg searching

Examining submerged vegetation for newt eggs is a speedy, effective survey method for detecting the presence of great crested newts. Newts lay eggs singly and fold pliable material, usually the leaves of aquatic plants, around them. The surveyor should search for folded leaves, and then gently open them to check for eggs. Great crested newt eggs can be distinguished readily from those of the smaller newts by their size, shape and colour, but it is not possible to distinguish smooth newt from palmate newt eggs. The jelly capsule of a great crested newt egg is oval and approximately 4.5 mm long, whereas that of the smaller newts is more rounded and approximately 3 mm in diameter. The newly laid egg inside the jelly coat is round in all species.



A Typical leaf folding in submerged great hairy willow herb
B Great crested newt eggs deposited on water mint surface a) freshly laid, b) developing



Newt egg colours may vary slightly. The eggs of smaller newt species (above) are off-white shades of grey and brown. Below the larger great crested newt eggs are pale yellow. Eggs may sometimes reflect colour from the enveloping leaf.

Great crested newts prefer to deposit their eggs on relatively larger-leaved plants than do the smaller newts, which makes their egg locations particularly conspicuous. Plants favoured by great crested newts include water forget-me-not (*Myosotis scorpioides*), water mint (*Mentha aquatica*), willowherb (*Epilobium* spp.) and flote grasses (*Glyceria* spp.) but any species can be used. Non-aquatic plant leaves trailing into the water may also be utilised. If many eggs are laid on grasses, the repeated folding can result in a concertina-like appearance.

In the absence of live plants great crested newts will also lay eggs on dead leaves, including leaves that have fallen into the pond, and litter, or on the surface of non-pliable objects, such as fallen twigs. In a situation like this it can be more difficult for a surveyor to detect the eggs, but artificial substrates can be used to the surveyor's advantage. A plastic bag cut into strips approximately 10-15 mm wide can be used to provide newts with an egg-laying substrate. The strips should be held together in a bunch with a length of wire, a twist-tie or similar, weighted or staked in a shallow area near the pond margin, and left, at least overnight. The strips can then be checked for eggs at the convenience of the surveyor and should be removed from the pond after the eggs have hatched.

Once unfolded, leaves or plastic strips will not re-adhere to eggs, so a surveyor should unwrap only the minimum needed to confirm newts' presence. Unwrapped eggs may suffer higher rates of predation. There is no benefit to be gained from unwrapping large numbers of eggs to count

them, as there is no way to relate egg counts to any meaningful measure of population size or viability.

Egg searching is best done from April to June, although some eggs can be found in March and July in smaller numbers.

Netting

Using a sturdy dipnet, with a 2-4 mm mesh, can be a useful survey technique, although in general it is not as likely to reveal the presence of newts as are egg searching, torching or bottle trapping. This technique is not very efficient in detecting adult great crested newts but is useful in capturing their larvae and adults of the smaller species. The presence of well-grown larvae is an indication of successful breeding – which can help in identifying a productive pond within a metapopulation. However, netting can cause a great deal of disturbance to a pond, and so should be employed with care. Invasive exotic plants, particularly New Zealand swamp-stonecrop (*Crassula helmsii*) and water fern (*Azolla filiculoides*) can easily be transferred between ponds via nets. If these plants are present then the pond should not be netted.

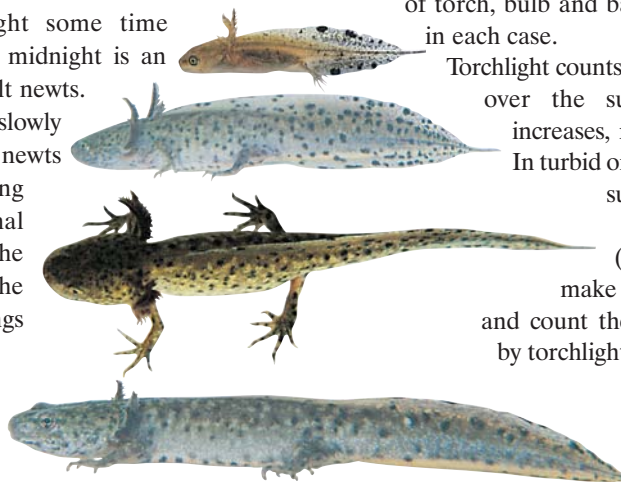
The best time for netting is generally from March to May, when most adults are in the pond, and mid July to August when larvae may be present in large numbers. Care should be taken not to damage larvae, which need to be handled very delicately (especially because of the external gills).

Netting can be standardised, to produce relative abundance scores. Fifteen minutes of netting per 50 m is consistent with guidelines on SSSI selection (see table below). However, due to the disturbance that netting causes, torching is a preferable technique to determine relative abundance.

Torching

Searching a pond by torchlight some time between shortly after dusk and midnight is an effective means of detecting adult newts.

The surveyor should walk once slowly around the pond, checking for newts in the torch beam, paying particular attention to marginal vegetation and open areas on the pond bottom. March to June is the best time, and warm, still evenings without rain are most productive. Although newts are active in rainy and windy conditions, the water surface can become too disrupted for



Larval development of great crested newts (shown life size) extends into autumn, when immatures leave the water



Adult great crested newts can appear brownish when viewed at night by torchlight. This female is noticeably plump at the start of her egg laying season.

clear viewing. Larvae can also be detected by torching during late summer and autumn.

The activity of newts, and hence their visibility during torch surveys, is heavily influenced by temperature. In very cold conditions newts can be so inactive that they may go undetected. The threshold water temperature below which torching becomes less reliable has not been established but 5°C can be taken as a working guide.

A powerful torch is needed, with an output of at least 100,000 candle power. Re-chargeable batteries are recommended.

Torching is a suitable technique for measuring relative abundance. Perhaps the most important issue regarding the choice of torch for those counting newts rather than recording presence/likely absence, is that of consistency. To compare counts between ponds or over time, the same type of torch, bulb and battery strength should be used in each case.

Torchlight counts are prone to showing ‘declines’ over the summer as vegetation cover increases, reducing the visibility of newts. In turbid or densely vegetated ponds, torch surveys are unsuitable.

To gain a population score (see below) the surveyor should make a single circuit of the pond and count the number of adult newts seen by torchlight.

Newt Species	Survey Methods	Population Score		
		Low	Good	Exceptional
Great crested newt	Seen or netted (day)	< 5	5-50	> 50
	Counted at night	< 10	10-100	> 100
Smooth newt and palmate newt	Netted (day)/counted (night)	< 10	10-100	> 100

Table 1. System for assigning population status based on numbers of newts seen or netted. Adapted from the Nature Conservancy Council's Guidelines on the selection of biological SSSIs (details in the *Herpetofauna Workers' Manual*).

Bottle trapping

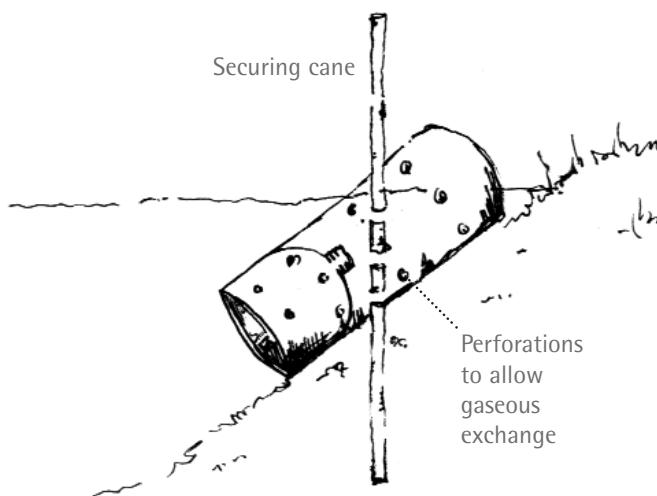
Both adult and larval newts can be trapped in ponds by the use of bottle traps. These can be made cheaply from empty plastic two-litre drink bottles. Newts find their way into the bottles but usually cannot leave.

Bottle traps are an effective way of detecting a population. However, bottle trapping of newts suffers from several drawbacks. It can be logistically onerous and there is a risk of harming newts and other wildlife. Hence bottle trapping is recommended only in exceptional cases (and never where water shrews may be present), for example, checking weedy or turbid ponds where torching is not reliable, or for ponds to which night-time access (for torching) is restricted.

Bottle trapping requires two visits to a pond for each trapping session; one to set the traps, and one to check them early the following morning. It can take a long time to set and collect a large number of traps and to transport them to and from a pond.

The use of bottle traps demands considerable care and should be carried out only by thoroughly trained persons. Evidence suggests that, at typical ponds with sloping sides, traps set on the bottom, in the pond margins, catch more newts, and do not suffer from over-heating, but if the air reservoir is depleted the newts can suffocate. Warmer water holds less oxygen, so this risk increases in hot weather and also in small, weedy ponds. Traps set at the water surface can have a constant air supply but are more susceptible to overheating. The risk of casualties increases with the number of newts in a trap. If large numbers of newts are likely to be caught extra care should be taken (more traps should be used and they should be checked very early the next day) or it may be safer not to use bottle trapping at all. In general traps should be set in the evening and checked early the following day, certainly before 1100 hours, and earlier in warmer weather or if large numbers of newts are anticipated.

Traps should be placed around the pond margins, facing towards the centre. Each trap should be held firmly in position by attaching to a cane or by pushing a cane through the bottle. Traps set at intervals of two metres have



Bottle traps must be used with extreme care to ensure that your method is lawful.

proved effective. Because of the potential danger to wildlife posed by lost bottle traps it is vital to ensure that all traps set are clearly marked, numbered and collected after trapping and that sketch maps are used to record their positions.

Since newt activity decreases at low water temperatures bottle trapping below 5°C cannot be relied upon to detect newts.

Drift fence and pitfall traps

Drift fences and pitfall traps are commonly used in studies of amphibian ecology and development mitigation operations. In conservation work they can be used to show the direction of, arrival at, and departure from, a pond or to detect occurrence and movements within terrestrial habitat. They are not a practical option for conservation surveys.

Recommended procedures

These recommended procedures are to guide conservation surveys. Mitigation work demands more stringent standards (English Nature, 2001).

Presence/likely absence survey

If carrying out a survey to determine whether newts are present or (likely to be) absent, then a surveyor should use a variety of techniques. A combination of egg searching, netting and torching is recommended. This can be expected to detect almost 90% of great crested newt populations. However, not all techniques will need to be deployed at each site, because once newts are detected then no further survey methods need be applied. A proposed procedure for a presence/likely absence survey is offered as a guide:

1. Obtain licence from statutory body.
2. Obtain permission of landowner to survey pond.
3. Make first visit to pond during daylight.
 - 3.1. Carry out egg search and netting.
 - 3.2. Familiarise self with the site in preparation for a night-time visit.
4. Make second visit to pond (if needed) after dark for night-time torching survey.

During the daytime visit the surveyor should walk around the edge of the pond, scanning weeds for evidence of newt eggs. A second circuit of the pond should be made, netting for up to 15 minutes per 50 m of shoreline. This daytime visit is also a good opportunity to reconnoitre the site in preparation for a second visit, after dark, to carry out a torch survey. If the pond is visited immediately prior to dusk, then the daytime and night-time surveys can be carried out during a single visit. However, if netting has increased water turbidity then it may be necessary to delay the night-time survey to allow visibility to improve.

Relative abundance survey

Netting, torching and bottle trapping can be used to measure relative abundance of newts in different ponds.

However, the logistical and welfare problems associated with bottle trapping and the inefficiency of netting in the capture of great crested newts mean that torching is the most suitable technique to measure relative abundance for this species. A proposed procedure for a relative abundance survey, using torching, is given as guidance:

1. Obtain licence from statutory body.
2. Obtain permission of landowner to survey pond.
3. Make first visit to pond during daylight to familiarise self with terrain.
4. Revisit pond from three to six times after dark, during peak season, for torch surveys.
5. Use highest count as a measure of population status and average to compare between sites or years.

Information on more involved relative abundance surveys can be found in Griffiths *et al.* (1996).

Collecting survey data

In addition to the species found or not found, at minimum, a record should include:

- date
- location (six-figure map reference)
- name of the recorder
- name and address of the pond owner.

Additional information could include a habitat description, threats to the site and a sketch map. Local Amphibian and Reptile Groups or recorders may have their own recording forms. There is also a model form in the *Great Crested Newt Conservation Handbook* and on the Froglife website.

Using survey data

All survey data, irrespective of the survey strategy, are valuable to conservation. Negative records (ponds surveyed where newts were not found) can be just as useful as positives. They help to identify survey 'gaps' by making a distinction between areas where newts have not been found and areas that have not been surveyed. All records, including 'negatives' should be sent to your local recorder and biological records centre (Froglife maintains a directory of local recorders). Building up a distribution map allows the information to be used for conservation planning purposes and to protect sites. Landowners should also be informed of the presence of great crested newts on their land and be advised regarding legal implications, habitat management and sources of conservation assistance. Ensure that landowners are aware of you reporting your findings.

Exceptional populations of great crested newts are eligible for designation as Sites of Special Scientific Interest (SSSI) (see section on *What data should I collect?*) and should be reported to the relevant statutory nature conservation organisation.

For larger targeted and blanket surveys, surveyors should also consider preparing a report. A suggested format is given below:

1. **Summary** A one page synopsis of the type of survey and results.

2. **Introduction** Information on habitat types and land use within the survey area; distribution of newts known prior to the current survey.
3. **Methods** When the work was carried out; by whom; which survey methods were used; number of ponds visited.
4. **Results** Number of ponds in which newts were found; relative abundance data; habitat information including pond density and condition; map of positive and negative results; list of all sites visited with results; indication of best sites; other species recorded; six-figure grid references of all ponds surveyed.
5. **Discussion** Any limitations to the survey; habitat associations; geographical associations; protective status of newt sites; conservation status of newts (comparison with old records); number of new sites found; number of sites lost or retained; prevalent threats and likely causes of losses; opportunities and suggestions for further work; conclusions.

Such reports should be widely circulated. The following are suggested recipients: Amphibian and Reptile Groups, Froglife, local planning departments, the local office of the statutory nature conservation organisation, the local Environment Agency or Scottish Environment Protection Agency office, local and national records centres, local museums and natural history societies.

Health and safety

Surveying for newts involves working close to water bodies, often after dark. Surveyors should be aware of two types of potential health and safety issues: hazards associated with water bodies (e.g. drowning and disease) and possible dangers associated with working outside at night, particularly in urban or suburban areas (e.g. theft or assault). Danger can be minimised by visiting all sites during daylight, prior to night-time surveys, carrying a mobile phone and avoiding working alone. Surveying for newts can often be carried out without entering the water. However, where bankside vegetation is dense this may necessitate wading through some areas, and egg searching may involve immersing hands in pond water.

Three main diseases to be aware of are tetanus, Weil's disease (leptospirosis) and hepatitis A. Weil's disease and hepatitis A can be contracted through ingesting infected water and Weil's disease can also enter the body through mucous membranes and broken skin. To protect against disease:

- ensure that tetanus boosters are adequate
- do not expose open wounds to pond water
- do not ingest or become immersed in pond water
- in case of injury, or if illness follows working near water, seek medical advice.

Health and safety issues are covered in various publications (the *Herpetofauna Workers' Manual* and *The Pond Book* [see *Further reading*]). Information on risk assessment can be obtained from Froglife.

Newt identification



Great crested newt male



Great crested newt female



Smooth newt male



Smooth newt female



Palmate newt male



Palmate newt female

Advice and assistance

Froglife

Froglife is a Lead Partner in the great crested newt Species Action Plan with The Herpetological Conservation Trust and the British Herpetological Society. Froglife offers training, information and advisory services.

Mansion House, 27-28 Market Place, Halesworth, Suffolk IP19 8AY. Tel: 01986 873733, email: froglife@froglife.org.

Amphibian and Reptile Groups (ARGs)

ARGs, making up the Herpetofauna groups of Britain and Ireland, are local voluntary groups concerned with herpetological conservation. In many areas, great crested newt conservation will be a priority, and ARGs are often

involved in co-ordinating surveys. Froglife supports the ARG (HGBI) network and can provide local contact details.

Statutory nature conservation organisations

These are the governmental advisors on nature conservation responsible for identifying and notifying SSSIs, providing advice on nature conservation and wildlife legislation and issuing licences for surveying (conservation).

English Nature, Northminster House, Peterborough PE1 1UA. Tel: 01733 455000.

Countryside Council for Wales, Maes-y-Ffynnon, Penrhosgarnedd, Bangor, Gwynedd LL57 2DN. Tel: 01248 385500.

Scottish Natural Heritage, 2 Anderson Place, Edinburgh EH6 5NP. Tel: 0131 4474784.

Method	Time of year (months)								
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Refuge searching									
Egg searching									
Netting						L	L	L	
Torching						L	L	L	
Bottle trapping									

Table 2. Summary of survey methods for great crested newts, showing the months when techniques are most likely to be effective, the peak season (dark shading), other months when techniques may be effective (light shading) and times when they are generally much less likely to find newts (unshaded). L = technique likely to find larvae.

Further reading

English Nature (2001). **Great Crested Newt Mitigation Guidelines**. English Nature, Peterborough.

Gent, T and Gibson, S (eds.) (2003). **Herpetofauna Workers' Manual**. Joint Nature Conservation Committee, Peterborough.

Griffiths, RA, Raper, SJ and Brady, LD (1996). **Evaluation of a standard method of surveying for common frogs (*Rana temporaria*) and newts (*Triturus cristatus*, *T. helveticus* and *T. vulgaris*)**. JNCC Report No. 259. Joint Nature Conservation Committee, Peterborough.

IACR-Centre for Aquatic Plant Management (2002). **Warning. Invasive Alien Pond Plants**. IACR-Centre for Aquatic Plant Management, Reading.

Langton, TES, Beckett, CL and Foster, JP (2001). **Great Crested Newt Conservation Handbook**. Froglife, Halesworth.

Williams, P, Biggs, J, Whitfield, M, Thorne, A, Bryant, S, Fox, G and Nicolet, P (2000). **The Pond Book. A Guide to the Management and Creation of Ponds**. Ponds Conservation Trust, Oxford.

Other advice sheets in this series

1. Frogs, toads and newts in garden ponds
2. Snakes need friends
3. Amphibians and roads
4. Signing toad crossings
5. Reptile and amphibian recording
6. Conserving grass snakes
7. Unusual frog mortality
8. Exotic reptiles and amphibians in the wild
9. The planning system and site defence
10. Reptile survey

The *Froglogue*, listing free and low-cost publications covering amphibian and reptile conservation, is available from Froglife (send an SAE).

Froglife, Mansion House, 27-28 Market Place, Halesworth, Suffolk IP19 8AY, 01986 873733, www.froglife.org

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