Natterjacks in amplexus (Fred Holmes)

11. Natterjack Toad

11.1. Background

The natterjack toad is a European Protected Species and a priority within the UK's Biodiversity Action Plan. Its Species Action Plan (The Herpetological Conservation Trust, 2009) highlights both the threats to the species and the conservation measures needed to address them. Habitat management advice for the natterjack toad, originally provided in the *Natterjack Toad Conservation Handbook* (Beebee and Denton, 1996) has been updated here.

In Britain the natterjack toad is a habitat specialist restricted to warm, open habitats on:

- Coastal dune
- Upper salt marsh
- Lowland heath
- Other habitats

As a pioneer species its ecology differs considerably from that of our other amphibians. Hence, it warrants its own section within this handbook.

11.2. Habitat requirements

The terrestrial habitat requirements of natterjacks are:

- Open, unshaded habitat.
- Extensive areas of unvegetated or minimally vegetated ground (maximum sward height 1 cm).
- Substrate(s) to burrow into.

Natterjack burrows (Bill Shaw)

During the day natterjacks shelter in burrows they dig for themselves in the open or beneath objects on the surface such as large stones, pieces of wood or other debris. They also shelter in crevices in rock piles or slag at sites where such features are present. By burrowing more deeply they escape daily and seasonal extremes of temperature.

Sand excavated from a natterjack burrow under a piece of roof tile (Anna McGrath)

Adult and juvenile natterjacks actively hunt their prey at night. They need open ground to see, pursue and capture invertebrates. Toadlets newly emerged from the tadpole stage are active by day.

Toadlets are active in the daytime and need damp, sunny areas of sparsely vegetated ground near breeding ponds where they can feed without the risk of desiccation (Ash Bennett)

Natterjacks breed primarily in ephemeral ponds that are highly weather-dependent and unpredictable. Consequently reproduction is 'boom or bust' with spectacular successes in some years being interspersed with partial or total failures in others. Natterjacks are relatively long-lived, which enables them to overcome occasional years of reproductive failure.

Characteristics of natterjack breeding ponds

- Unshaded
- Ephemeral
- Shallow with gradually sloping sides
- Free of predators and competitors
- Little or no vegetation

Natterjacks spawn in shallow water (5-10 cm), so ponds with shallow margins and gently sloping sides are ideal. During the daytime tadpoles feed in warm shallow water and at night they move deeper.

Natterjack tadpoles using shallow edges of breeding pond (David Woodhead)

Natterjacks thrive in relatively dry habitats where other amphibians find it very difficult to survive. However, should changes to the habitat allow their breeding ponds to be colonised by common frogs, toads and great crested newts, then natterjacks may become eradicated.

Common frogs and common toads breed earlier in the year than the natterjack, and their tadpoles may feed on natterjack spawn. Surviving natterjack tadpoles fare very poorly with the more advanced tadpoles of the other two species, which outcompete them. Where the more common species are abundant they tend to dominate all of the locally available breeding ponds and exclude natterjacks.

Great crested newts eat large numbers of natterjack toad eggs and tadpoles. Most other vertebrates leave them alone because of their distasteful skin. Natterjack tadpoles do, however, fall prey to a range of invertebrate predators especially dragonfly and damselfly nymphs, dytiscid water beetle larvae and adults and water-boatmen.

Fortunately the natterjack has a great capacity to recover once key habitat features have been restored. The management work required might be as straightforward as recreating breeding ponds or increasing the number of livestock grazing terrestrial habitat.

Agri-environment schemes (Environmental Stewardship in England, Sustainable Rural Development Programmes in Scotland and Glastir in Wales) may fund management options appropriate to natterjack toads. See *Natterjack Toads and Environmental Stewardship Options* (The Herpetological Conservation Trust, 2008) for guidance regarding suitable options.

11.3. Natterjack habitat

Coastal dune Natterjacks prefer frontal dune systems with extensive areas of bare sand with some vegetation cover such as marram grass. Overly fixed dunes, supporting extensive birch, willow, sea-buckthorn or rank grasses are unsuitable because they provide little open ground on which natterjacks can forage. Furthermore, the dense vegetation may support other amphibian species which are competitively superior to natterjacks during the tadpole stage.

Natterjack coastal dune habitat, North Walney, Cumbria (Bill Shaw)

In dune systems natterjacks breed in shallow, ephemeral slacks that typically desiccate around midsummer. Poorly vegetated slacks on frontal ridges are especially suitable as they contain few invertebrate predators of tadpoles. Other pools on the seaward side of dunes may also be used where fresh water flows out from the dune system.

Dry stone wall and bank used by natterjacks as shelter and a hibernation site (Bill Shaw)

Upper saltmarsh On most upper saltmarsh sites natterjacks use features such as embankments, patches of dune and dry stone walls for burrowing and shelter.

Natterjacks breed in shallow pools at the upper edge of saltmarsh, which are inundated with seawater during high tides in spring and autumn, but which freshen up due to rainfall or run-off from in land in late spring and early summer. Seasonal saltwater inundation removes predators and competitors from the breeding pools leaving them in an ideal state for natterjacks.

Upper saltmarsh habitat, Campfield Marsh, Cumbria (Bill Shaw)

Lowland heath Sparsely vegetated heath provides habitat for natterjacks. Heath supporting low-growing mosses or lichens with areas of open sand interspersed with heather shrubs forms ideal terrestrial habitat. Uniformly dense stands of heather are unsuitable because they hinder foraging. Scrub encroachment is problematic as sites supporting scrub and dense vegetation may favour other amphibian species.

Shallow, ephemeral heathland pools provide breeding sites. Occasionally the shallow margins of larger water bodies are used. Coarse fish such as perch may be helpful in larger ponds; they prey on invertebrate predators of natterjack tadpoles but avoid the tadpoles themselves due to their distasteful skin toxins.

Vegetation in and around breeding ponds should be minimal.

Natterjack breeding pond on heathland, Woolmer Forest (Tim Bernhard)

Natterjack eggs and tadpoles cannot tolerate very low pH levels so breeding ponds must be pH 6 or greater for spawn and tadpoles to develop successfully.

Other habitats In Britain atypical habitats include a disused sand quarry, an area of moorland and a disused ironworks, all in Cumbria. These sites provide habitat characteristics similar to those described above. Thus the quarry approximates to dune, the moorland to lowland heath and the ironworks is covered by rubble and slag with very little vegetation but plenty of refugia.

Slag from a disused ironworks provides terrestrial habitat for natterjacks in Millom, Cumbria (Ash Bennett)

Under favourable conditions natterjacks may move from their more typical habitats to adjacent farmland. A broken or blocked field drain may result in shallow flooding that provides an ideal short-term breeding site. Before financial incentives were provided to make marginal land more productive through drainage and infilling, natterjacks made great use of ephemeral pools on pastoral farmland but this is now an unusual situation.

Natterjacks benefit from some common farming practices e.g. grazing on dunes and merse (coastal marsh). Other activities inevitably kill individual toads or damage their day or winter hiding places so it is necessary to minimise risk. As long as there is no large-scale loss of land habitat and breeding ponds remain in good condition, occasional small-scale losses can be borne by the population.

Both Entry and Higher Level Stewardship in England include options of considerable value to natterjack toads. These are detailed in the leaflet *Natterjack Toads and Environmental Stewardship Options* (The Herpetological Conservation Trust, 2008).

11.4. Habitat management

In most situations the priority for conservation management should be to maximise the breeding success of natterjack colonies by increasing the number of suitable breeding ponds. Research has shown that toadlet and juvenile survival is a key factor limiting the growth or recovery of populations. In simple terms, increasing the number of ponds should produce more toadlets which in turn will lead to a population increase. The extent of suitable terrestrial habitat should then be increased as breeding success improves.

Aquatic habitat Breeding ponds should be free from surrounding scrub and minimally vegetated throughout. Grazing provides the best long-term means of maintaining short vegetation but annual cutting is an alternative. In the autumn relatively short vegetation in the pond basin can be cut by mowing or flailing and the arisings collected and removed. If necessary the original depth of the pond can be restored by removing a few centimetres of substrate from the pond basin.

The temptation to deepen ponds after a period of low rainfall and early desiccation should be resisted unless there is good reason to believe that the water table is experiencing a long-term downward trend.

Fish stocking as a management tool Most natterjack ponds are ephemeral and consequently do not support fish but a number are more permanent. Large ponds often support coarse fish which, by eating invertebrates and common frog tadpoles, can reduce both predation of, and competition with, natterjack tadpoles. At a suitable density small perch (approximately 8 cm) improve natterjack tadpole survival to metamorphosis by removing invertebrate predators, as also have carp (Denton, Hitchings and Beebee, 1995). On the other hand rudd are unsuitable because they eat natterjack tadpoles.

If ponds fail to desiccate due to a series of wet summers and natterjack reproduction declines, the introduction of fish should be considered as a management option to restore productivity. When ponds finally begin to dry the fish should be removed and released elsewhere. Further experimental research is needed to identify other beneficial fish species and test the technique further in the field.

Terrestrial habitat The appropriate management of terrestrial habitat not only directly favours natterjacks but also makes it less suitable for competitors and predators such as common toad, common frog and great crested newt.

Grazing (left of fence) maintains the short sward required by natterjacks in merse at Anthorn, Cumbria (John Buckley)

Ungrazed terrestrial vegetation renders this site inhospitable to natterjacks (David Orchard)

On most natterjack sites grazing is key to the maintenance of the required short sward. At some sites grazing by rabbits may suffice. Otherwise a choice of domestic livestock (sheep, cattle and ponies/horses) should be considered. Cattle are usually the most useful because they require less attention than sheep, are less prone to interference by dogs and, through their size, can break up turf to create bare ground in places. A lot depends, however, upon how sites have been grazed traditionally, what grazing is currently in place and what further animals are available. Stocking density should be tailored to individual sites, dependent on factors such as the amount and type of grazing available, existing rabbit numbers, and the level of natural erosion. It is virtually impossible to overgraze a site for natterjack conservation.

Where necessary, rabbits can be encouraged to graze new areas by providing corridors of shorter vegetation. Providing cover/shelter in the form of piles of loose brash/tree branches can be used to encourage rabbits to start burrows and create warrens.

Short sward maintained by scrub clearance and grazing at Woolmer Forest (ARC)

Changes in vegetation at Drigg from 1987 to 2005 due to decreased grazing intensity, reducing the suitability of habitat for natterjacks (David Simpson, Richard Cooper and Ash Bennett)

11.5. Habitat restoration

When terrestrial habitat is in poor condition various techniques, including mowing and collecting, foliar spraying, weed wiping, chain sawing and grubbing out vegetation with machinery, may be used as appropriate to achieve the desired result.

Where large areas of scrub encroachment have developed there is little alternative to manual or mechanical clearance as a first step towards the recreation of open habitat. Mechanical methods are not as damaging to the habitat as might be expected and they have been used very successfully at sites throughout the country. The precise methodology for each site should be chosen by considering the size of the trees/scrub to be removed, the types of machine available and the level of funding.

Essentially the job consists of cutting down/grubbing out the scrub, moving it to a fire site and burning all the material. The ashes from the fire should be deeply buried (not simply covered), along with the humus rich layer developed under the scrub. Burying this material prevents the growth of ruderal vegetation such as docks and nettles and creates bare clear ground. Alternatively, unwanted material can be removed off site although this usually incurs extra costs.

Cut stumps left in the ground should be treated with a glyphosate or triclopyr based herbicide to prevent regrowth. Small saplings might best be dealt with by foliar spraying.

Restoration management techniques may simply be repeated at intervals to maintain terrestrial habitat but this can be a costly approach. Far better and potentially cheaper is to establish a grazing regime.

Ponds that have been lost through drainage can often be restored by simply disrupting the drainage system (for example by blocking a ditch or field drain).

The turf dam in central foreground blocks a ditch and slows the passage of fresh water to the sea. Water is now held in breeding pools and the surplus spills out over the saltmarsh (Ash Bennett)

11.6. Natterjack pond creation

Natterjack ponds are often called scrapes as this best describes how they are made with a machine. With a knowledge of water table behaviour at the chosen site, ponds should be created with very gently sloping sides (1:10 or more gradual) dug down to a maximum water depth of 50-70 cm. In some situations it might not be possible to create a pond with all sides gently sloping and a compromise has to be made. Ideally the slope of the pond basin should be such that the scrape has a wide drawdown zone and an almost imperceptible edge. The scrape should dry out in late summer in an average year. This may require a trial and error process, making the scrape and then slightly deepening or infilling it in a subsequent year. Experience shows that it is probably better to err on the side of making the pond too shallow in the first instance.

A scrape with an asymmetrical cross-section to give a shallow edge on the left and deeper water to the right (David Coward)

Late summer/early autumn, when the water table is low, is the best time of year for making natterjack ponds. A tracked, 360º machine or a JCB are suitable for the purpose. Scrapes vary in size from a few to hundreds of square metres. Small scrapes can be very productive but they require a lot of maintenance. A scrape with a 10m diameter of water (approximately 80 m2) at the start of the breeding season is a good starting point for planning.

Machinery such as a 13 tonne, tracked, 360º excavator is suitable for creating natterjack scrapes (John Buckley)

Spoil from the scrape should be spread on the ground away from the pond edges and not compacted. Low piles of spoil, < 50 cm high, may be of some use to natterjacks, whilst taller engineered features tend to be less attractive to them.

A natterjack site should ideally include a range of ponds of differing depths so that at least one or two will successfully produce toadlets in any one year.

Three scrapes with different characteristics in relatively close proximity (David Coward)

11.7. Lined natterjack ponds

Lined, or artificial, ponds are made by lining a suitably shaped hollow with a waterproof layer such as butyl sheeting, bentonite roll or concrete.

Lined ponds have the advantage that they do not rely on ground water for supply and they can be topped up if low.

A disadvantage of concrete lined ponds is that they lack a damp drawdown zone where toadlets can feed, grow and shelter before dispersal.

A concrete-lined natterjack breeding pond in sand dunes (Chris Gleed-Owen)

Natterjack scrape being lined with prehydrated bentonite (RAWMAT® HDB) at Mawbray Banks (Bill Shaw)

11.8. Literature

Beebee, T. and Denton, J. (1996). Natterjack Toad Conservation Handbook. English Nature, Peterborough.

The Herpetological Conservation Trust (2009). Natterjack Toad Species Action Plan. www.arc-trust.org/downloads/Natterjack_toad_SAP_Aug_09.pdfHerpetological Conservation Trust

The Herpetological Conservation Trust (2008). Natterjack Toads and Environmental Stewardship Options, Wealth of Wildlife Project, Cumbria Wildlife Trust, Kendal.