

Amphibian Health & Disease

Information & practical advice

Exotics and amphibian disease

Exotic (also called introduced, alien or non-native) amphibian species are thought to be prime candidates in the spread of disease.

If you spot any exotic amphibian species it is very important that you get in touch with Froglife. If you can take a photograph please do so, so we can validate your findings quickly.

Glossary

- Amphibian - A cold-blooded animal capable of living both on land and in water. Gilled aquatic larvae and air breathing adults.
- Desiccation - Dryness resulting from the removal of water from an organism.
- Genus - A group of closely related organisms.
- Iridovirus - A family of viruses that can infect insects, frogs and fish.
- Metamorphosis - A rapid change of body form from tadpole to juvenile frog, toad or newt.
- Mortality - Deaths in a population of animals
- Pathogen - Any small organism, such as a virus or a bacterium which can cause disease.
- Predation - An interaction where one species feeds on another.
- Predator - An animal that survives by feeding on other animals

causes of death at this stage are predation or desiccation (drying out on rocks or paving slabs).

If you suspect chytridiomycosis, please contact Froglife immediately and we will lead you through the next steps.

What Froglife needs you to contact us about!

If you see any suggestion of chytrid fungus in your frogs, toads or newts. If you think you have noticed ranavirus disease or if you are noticing any other cases of unusual amphibian mortality, please contact Froglife who will record your details to add to the 'Frog Mortality Project'.

The Frog Mortality Project

The Frog Mortality Project is a partnership project between Froglife and the Institute of Zoology, London. It aims to inform the public about amphibian disease in the UK, to identify and report on outbreaks of amphibian disease in the UK and to acquire data on incidences of amphibian disease.

Resources Available from Froglife

1. 'Pond Heaven - How to Create your Own Wildlife Pond' booklet
2. 'Frogs & Toads' by Trevor Beebee
3. 'Field Studies Council - Guide to the Reptiles & Amphibians of Britain & Ireland' water proof fold-out identification chart
4. 'Field Studies Council - Guide to Keeping Tadpoles' water proof fold-out identification chart

Other advice sheets in this Froglife series

1. Frogs, Toads and Newts in Garden Ponds
2. Snakes need Friends
3. Amphibians and Roads
5. Reptile and Amphibian Recording
6. Conserving Grass Snakes
8. Exotic Reptiles and Amphibians in the Wild
9. The Planning System and Site Defence
10. Reptile Survey
11. Surveying for (Great Crested) Newt Conservation

Resources available from English Nature

1. 'Amphibians in your Garden' leaflet
2. 'Garden Ponds and Boggy Areas; Havens for Wildlife' leaflet

Froglife wishes to acknowledge the kind contribution from J. Butterfield and the financial support of English Nature.

FROGLife



J. BUTTERFIELD

FROGLife

White Lodge
London Road
Peterborough
PE7 0LG
Tel: 01733 558444
E-mail: info@froglife.org
Visit: www.froglife.org

Frog or toad?



Frogs have a distinctive black mask behind the eye. Long (often stripy) legs and move by jumping.



Toads' skin is drier and bumpier than frogs. They move by walking or hopping rather than jumping and have striking coppery eyes.

Introduction

Worldwide, one third of all amphibian species are now thought to be threatened with extinction and many others face severe population declines. Habitat loss is the main cause of declines worldwide but there is a growing recognition of the threats posed by infectious disease. Numbers of frogs, toads and newts in the UK have declined over the last century largely because of destruction, alteration and fragmentation of their habitats. Although it is thought unlikely that diseases have contributed substantially to these declines, there is concern that they may impact on them in the future.

This advice sheet deals with diseases and other causes of death in native amphibians in the UK. It gives information on how to recognise symptoms that could appear in your local amphibians.

In recent years, garden ponds have become the main refuge of the common frog in urban and suburban settings. Other species like the smooth newt and common toad can also be drawn to gardens for the wealth of food they provide. These amphibians play a vital role in the food chain, acting as a natural pest control as well as a food source for other wildlife like owls or grass snakes.

Many people find enjoyment in watching frogs' lives unfold in their gardens and the observations of frogs have a very important role to play in finding out more about unusual or unexplained amphibian deaths. Simple data from reports of these cases can give us information that has a bearing on all amphibian species in the UK.

Identifying frogs, toads & newts

It is important you can identify the different amphibians that you may come across in your garden. This is because there are a number of diseases that can affect toads, frogs and newts alike and we need to know which species is being affected.

Froglife can provide you with a colour wall chart of all the amphibians you are likely to come across in the UK. Alternatively, you can refer to English Nature's 'Amphibians in Your Garden' leaflet or the Field Studies Council's 'Guide to Amphibians and Reptiles of Great Britain and Ireland'.

If you are still unsure which species you are dealing with why not take a photograph and we can identify it for you. Send your photograph to the Froglife address at the end of this leaflet - either via email, post or multimedia text message from your mobile phone.

FROGLife

www.froglife.org

Which newt is it?



© Froglife

Great crested newts are the largest British newt and can reach more than 170mm in length. They have dark granular skin. Males have an iridescent stripe down their tail and a large jagged crest during breeding.



© Froglife

Smooth newts have pale bodies with dark spots on the underside of their throats. Males develop an undulating crest during breeding.



© Froglife

Male palmate newts have a dark webbing between their back feet and a thread-like tail filament. The underside of their throat is not usually spotted.

Common causes of mortality in frogs, toads & newts

Britain's frogs, toads and newts produce a large amount of spawn to combat the many hazards their offspring will face. Many of the eggs, tadpoles and juveniles will perish along the way because of predators, harsh environmental conditions, poor health or disease.

Although it may seem strange to us, mortality – sometimes in huge numbers – is a normal aspect of amphibian ecology. For example, in the wild, common frogs often lay their spawn in very shallow ponds, which in some years dry up killing all tadpoles but in other years with higher rainfall many tadpoles will survive. By laying many eggs each season the frog can ensure that even a total loss one year will not endanger the population in the long term. This reproductive strategy is dramatically different from that of mammals and birds which have smaller numbers of young but who have a better chance of survival.

Data obtained from Froglife's annual 'Frogwatch' survey shows that many people come across one or two frog deaths each year with no major effect on the overall population. So finding the odd dead frog is normally nothing to worry about. Causes of amphibian deaths can be separated for each life cycle stage.

Causes of spawn failure

Each adult female amphibian can lay hundreds, often thousands, of eggs. Much of this spawn will not make it past the hatching stage and there are a number of reasons for this...

Normal frogspawn consists of a central embryo surrounded by a clear jelly-like capsule. When laid, the embryo is dark brown-black with a creamy white underside which turns dark after a few days. Normally this underside is not visible to us unless the spawn clump has been overturned, so don't be concerned if you see partially light-coloured spawn just after it has been laid.

Late frost

Unusually warm periods coming out of winter can cause frogs to spawn early. If the weather changes rapidly and overnight frosts occur the spawn can freeze and kill the developing eggs. If it is a light frost it is sometimes only the spawn closest to the surface that will be killed, the rest may survive as it is more insulated from the cold.

Unfertilised spawn

Some spawn is laid partly or completely unfertilised and so will not develop at all. The spawn will have a normal "jelly" appearance but will become cloudy and fungus may infect it as it rots.

Fungus

If we have a particularly cold spring you may find spawn in your pond covered with a white thread like feathery fungus that looks not unlike cotton wool. It often occurs when spawn has been killed off by late frosts, although there may be other reasons for this phenomenon that Froglife is looking into.

Do not move your frogs, spawn or pond plants to other ponds. Report the incident to Froglife (see below). There is no evidence that suggests that this disease can infect fish, people or their pets.

How did it get into my garden?

It is still largely unknown how the disease spreads but we do know that it is more likely to occur in certain conditions. Ranavirus seems to be temperature and density dependant - this is why there is a peak during the summer months of July and August when air temperatures are high and when there are large numbers of frogs in and around ponds, which is where most of the mortality occurs.

Is there a cure or any treatment?

There is no known cure or treatment for this disease, nor is one likely to be found in the near future. The best advice is to let it pass through your population of frogs naturally. Some affected populations do recover in the years after the initial outbreak.

If you suspect your frogs are dying from this disease please fill out the Frog Mortality Questionnaire that can be downloaded from Froglife's website - www.froglife.org. The data that we receive is very important in understanding how this disease is spread and how severe the problem is. It can give us a unique insight into amphibian disease that can provide a basis for better understanding the long-term effects of this disease on amphibian populations.

Information from the Frog Mortality Questionnaire will also provide a framework which can possibly be applied to other new diseases that threaten our amphibians.

Chytridiomycosis

Chytridiomycosis is an infectious disease that appears to be a major factor in dramatic amphibian declines in some parts of the world. The disease is caused by a type of fungus called a chytrid, which can potentially kill all of the individuals in a population. The disease is carried by healthy tadpoles and when these tadpoles metamorphose the fungus spreads within their skin.

Research on chytridiomycosis is at an early stage, and there are many areas we still do not understand fully. One interesting aspect is that many amphibians have been found to carry the chytrid fungus but suffer no ill effects.

What to look for:

In most cases, the only dead amphibians are those that have recently metamorphosed, although dead adults might also be found.

Symptoms of chytridiomycosis infection in a population include:

- Large numbers of dead froglets, toadlets (May-June) or newtlets (June-September), just after they metamorphose.
- Skin flaking
- Lethargy
- Dead amphibians with no obvious cause of death or signs of disease.

Mass mortality at metamorphosis is the main thing to watch out for. The other symptoms may not develop and may be difficult to observe without close inspection.

Has the disease been found in the UK?

The disease is most prevalent in North, Central & South America and Australia. In 2004 it was found for the first time in a population of North American bullfrogs which had been introduced to a site in the south-east of England. Extensive research is now being carried out on other amphibians in the area to find out if the disease has crossed over into the native British amphibian population.

Please check with Froglife (www.froglife.org) for updates.

What species of amphibian can be affected?

Chytrid fungus can probably infect any amphibian but each species is thought to have differing levels of susceptibility. It appears to affect species which live around streams and at high elevations but there are exceptions. The common toad lives at low elevations and in large, still water bodies but has suffered in isolated areas of mainland Europe from the disease. In the UK, chytrid fungus is thought to be of most potential threat to the common toad. The natterjack toad is also known to be susceptible to this disease.

How do I recognise chytridiomycosis, and what should I do?

You may notice large numbers of frogs, newts or toads emerging from the pond and dying for no obvious reason. The most common "typical"

mortalities, as this may threaten a population. This is more likely to occur with some diseases introduced from abroad, as native amphibians may lack immunity to novel pathogens.

The most common amphibian disease in the UK is ranavirus disease. It occurs mostly in the south and south-east of England, with scattered cases elsewhere.

Another disease of interest is chytridiomycosis. This particularly threatening disease seems to have played a large part in some tropical amphibian declines and was found in a non-native species of amphibian in the UK in 2004. Whilst it has not yet been confirmed in wild UK amphibians we are including information here so that if any likely cases occur they can be reported.

Ranavirus

In the late 1980s unusual mortalities of common frogs were reported in the south-east of England. Frogs were found to be suffering from a variety of symptoms, sometimes with secondary bacterial infections. After a dramatic increase in cases in the south-east throughout the late Eighties, the Frog Mortality Project was set up to monitor and report on the extent of the disease in the UK. The Frog Mortality Project is a joint partnership between the Institute of Zoology (at the Zoological Society of London) and Froglife.

From 1992 to 2005, Froglife received over 3,400 potential reports of this disease and information on the deaths of over 62,000 common frogs have been recorded, to date.

In-depth studies by the Institute of Zoology in London have revealed the cause as an iridovirus belonging to the genus *Ranavirus*. Ranaviruses are a group of viruses that infect fish, amphibians and reptiles and some have been shown to kill spawn and tadpoles as well as adult amphibians.

Symptoms:

- Redness of the skin (erythema)
- Skin ulcers or sores
- Bleeding (systemic haemorrhaging), especially from the mouth or anus
- Breakdown of limbs (limb necrosis)
- Drowsiness (lethargy)
- Abnormal wasting (emaciation)

There are two main disease syndromes (internal bleeding and skin ulceration) and animals can suffer either or both. If the animal is suffering from skin ulcerations then it will take longer for the animal to die, therefore those suffering with this will be those more likely to be in poorer body condition. However, animals can have the disease but show no clinical signs of infection.

You may have seen the term “red-leg” used in relation to ranaviral disease, but it is a rather misleading name. Many frogs affected by ranavirus do not develop reddening of the skin. In addition, frogs may develop red skin through other infections, not associated with ranavirus and some healthy frogs naturally have red skin.

How do I recognise ranavirus infection?

The disease is most apparent during summer, especially hot days from June to August. You may find dead and dying adult frogs in and around your pond. The frogs may appear slower and/or thinner than usual, and there may be bleeding or ulceration. However, in some cases the dead frogs have no obvious external symptoms.

Can it occur in any other species of amphibian?

Ranavirus is not just restricted to frogs, it can also occur in common toads.

Where has this disease come from?

The patterns of infection indicate that ranaviral disease is relatively new to the UK. Studies have shown the virus to be closely related to those found in North American amphibians. One possibility, yet to be fully investigated, is that the virus was introduced with imports of North American bullfrogs or freshwater fish.

Froglife receives many reports of escaped bullfrogs and non-native amphibians each year - see ‘Exotics’ section.

What should I do if I think my frogs have this disease?

Contact Froglife before you dispose of any bodies as occasionally pathological examinations may need to be carried out. If we subsequently ask you to dispose of the bodies it is important that you do so responsibly by either burning or burying them. Do not place them in bins as this could help to spread the disease.

Predators

All frog life-stages form a natural part of the food chain. Spawn is probably the life cycle stage that is safest from the attack of predators. However, newts, moorhens, flatworms and fish will all eat spawn.

Usually dead eggs will have grey or white centres, however, live eggs with all-white centres very occasionally develop into albino tadpoles and froglets.

In some cases, ponds may appear to be literally full of tadpoles. If your pond appears to have a very high density of spawn, it is not necessary to remove any. Tadpoles can survive at very high densities and will be naturally ‘thinned out’ as the weakest die or are predated upon. This is a completely natural process, a method that amphibians have evolved to ensure that only individuals best suited to a habitat will survive.

Tadpole loss

Predators

Being a tadpole is a very risky time for amphibians, since they are eaten by almost every aquatic predator there is. The list includes dragonfly larvae, diving beetles, water boatmen, newts, ducks, blackbirds and grass snakes.

Again, this is nothing to worry about since in most cases some of the tadpoles will survive and emerge as froglets.

Food shortage

Tadpoles feed primarily on the algae that grows on plants and rocks in the pond, along with decaying matter such as dead pond animals. In some ponds that are newly created or poor in nutrients there may be little food available. This can lead to slower growth and later emergence, or even cause the tadpoles to over-winter at the bottom of the pond. Longer development times are not normally something to worry about. Adding food is not recommended as it can lead to excess nutrient levels.

Over-wintering of tadpoles can also occur if there is a mild summer or if your pond is in a shaded position which means less light is reaching it.

The algae that the tadpoles feed on requires light to grow, so in some cases it might be worth cutting back overshadowing branches or foliage near your pond.

In rare instances you may also come across neotenus tadpoles. These are tadpoles that are unable to metamorphose and hence continue growing, occasionally to lengths of up to 4 inches! Please let Froglife know if you notice tadpoles of this size in your pond since it is possible you might unknowingly have an exotic species of larger amphibian that has taken up residence in your pond (see ‘Exotics’ section).

Dried-up ponds

If a pond dries up before the tadpoles have metamorphosed, they will not survive. While you have tadpoles in your pond it is best to keep an eye on the pond’s water level and top it up if it’s getting low. If possible you should use rainwater which you can collect in a water butt - this is free from chlorine which can kill tadpoles. In the autumn after all the froglets have left your pond you may want to replace the lining to prevent similar problems the following year. For information on relining garden ponds see Froglife’s ‘Pond Heaven’ booklet.

‘Disappearing’ tadpoles

People often report that their tadpoles simply ‘disappear’. There are a number of reasons why this could be. Sometimes they may be hiding in the silt at the bottom of the pond or in the vegetation at the edge because as they grow larger, they tend to become more secretive. In other cases it might suggest that predators, such as newts or dragonfly larvae exist in the pond in large numbers.

Tadpole development can often be amazingly rapid in favourably warm periods. So in many cases ‘disappearing’ tadpoles can suggest that metamorphosis has taken place, the froglets have emerged en-masse and moved into the surrounding habitat without you ever being aware.

Anoxia

Another possible reason for loss of tadpoles is anoxia. Anoxia occurs when the oxygen levels in a pond drop so low that the animals in there begin to suffocate. This can occur when a pond is too full of algae, or if certain contaminants are in the water. In fact, pollutants in general may cause massive tadpole mortality. A possible indication of this would be any recent spraying or fertilizing activity, road building or construction nearby with associated run-off, or even a sudden algal bloom in the pond.

Froglet/toadlet loss

Drowning

Once they have absorbed their tails and are ready to leave the pond, froglets are effectively 'air-breathers' and hence want to escape from the water as quickly as possible. Many froglets have difficulty emerging from ponds, especially if the sides are steep. As a result a large number can drown whilst trying to emerge. It is therefore a good idea to make sure at least one side of your pond has a gentle sloped exit. You could do this by adding an object into the pond to act as a ramp. This could be rocks or bricks, plant substrate or rafts of bark.

Desiccation (drying out)

When a froglet emerges from the pond it immediately needs cover from vegetation to stop it from drying out. If your pond is in the middle of a short cut lawn or patio then the chances are, if the froglets emerge on a warm summer's day, they will quickly dry out and die. It is a good idea to plant vegetation at the shallow end of the pond so they have somewhere to hide until it cools down enough for them to disperse fully into the surrounding landscape. Allow vegetation immediately around the pond to grow a little longer, at least during May and June, and leave some rocks or logs here to act as damp refuges.

Predators

As froglets emerge from the pond they are particularly vulnerable to predators. Often 'mass emergence' of froglets can lead to a frenzy of predators putting in an appearance. There are usually a number of common garden bird species involved and often hedgehogs, badgers and foxes can get in on the act.

Adult amphibian loss

Once froglets disperse they will leave your pond and stay on land (possibly some distance away) for 2 – 3 years before returning as adults. So, one day your garden can be teeming with froglets and the next it can appear to be empty.

Predators

Adult frogs are also part of the diet of a long list of predators.

Natural predation can be upsetting to us but will do little real damage to the number of frogs in your garden population.

Successful predation normally means you will see no trace left of the frog, but sometimes bodies do get left behind. If you come across a dead frog in your garden, in many cases it's possible to tell which predator may have been involved.

Below is a brief description of tell-tale signs to look out for:

- Herons – you will often see a pointed entry wound – the result of being stabbed with the beak.
- Rats – can be a problem around breeding time if they are in your area. Rats will attack and kill many toads and frogs as they congregate to breed. Often you will find bite marks around the belly through which they pull out the internal organs.
- Cats – they will often bring frogs into homes as 'presents' for their owner. If your cat brings in a live frog put it outside in some undergrowth and keep the cat indoors so the frog has a chance to escape. It is also a good idea to keep your cat inside at night so it can't attack the night time wildlife in your garden.
- Otters – will often peel the skin from toads' legs and eat the muscle underneath. This is because, like many animals, they find toad skin distasteful. Frogs may be eaten whole as they lack the distasteful skin chemicals.

Predation is linked to other factors. For instance, if pollution is a factor, then tadpoles or frogs most affected by pollutants may be easier prey. Similarly, amphibians suffering from disease may also be 'easy pickings'.

Crossing roads

Every year thousands of toads and other amphibians are killed on roads whilst migrating to their breeding ponds. The problem can be so bad that populations of toads have become locally extinct, sometimes in only a matter of years. In the days following migration the dried bodies of the dead (often squashed) amphibians are seen to litter the road. Toads and newts can also fall into roadside drains, from which escape is normally impossible.

If there is a road you know of where year on year numbers of toads are killed and you would like to get involved and help to stop this happening then contact Froglife for more information or refer to 'Froglife Advice Sheet 3'.



Winterkilled frog floating in pond



'Mating ball'



Toad fly infestation



Dead frog with skin lesions and redness associated with ranavirus

'Winterkill'

Some frogs will choose to over winter at the bottom of ponds as they can breathe through their skin and because the water temperature there stays fairly constant. However, in severe winters when a pond is completely frozen over for a prolonged period of time, the decomposition of vegetation within the pond can cause a depletion of oxygen that causes 'anoxic' conditions. This can suffocate not only the frogs but many other organisms which are down there.

After the frosts have gone the dead frogs will float to the surface of the pond and will often appear bloated. Death of a few individuals through winterkill is a natural process and not a problem for the population, but some garden pond owners wish to reduce this cause of mortality. The best way to prevent winterkill is to place a ball in a pond before it freezes over and then remove it after the ice layer has formed. The hole that remains should allow oxygen and other gases to enter and exit the pond. If the pond has already frozen over, place a bowl of hot water on top of the ice until a hole has formed. In the longer term, removing excess decaying material from the base of your pond may help (but leave some material behind as it is a great habitat for many pond animals).

'Inflated' amphibians

Occasionally frogs, toads or newts are found with an inflated appearance. We do not know the cause of this, though it seems likely that some infection causes problems with the animal's water balance, causing it to swell up with fluids. In many cases the animal recovers if left alone.

Drowning

Female frogs that arrive early to a breeding pond are immediately grabbed by males – often many at a time - who will not let go until she expels her spawn. Many females become exhausted from all of this male 'attention' and can drown. Competition for female toads can be higher than for frogs – females can be grabbed by multiple males, which again, often leads to females drowning, or suffering from exhaustion before, or (more often) after, spawning. This is a normal part of amphibian behaviour and it is not advisable to try to separate frogs or toads.

'Toad fly'

This can be a particular problem to common toads in late August. A species of green-bottle fly lays its eggs on the head of a toad and, once the eggs hatch, the maggots will crawl up the toad's nostrils and begin eating the soft tissue in the nose and head. This can cause them to make a 'clucking' noise as they try to breathe in air. The presence of this native parasite will, in most cases, ultimately lead to the toad's death. As it is a natural process it is best not to intervene.

Diseases

If there is no evidence that predators or harsh environmental conditions are responsible for amphibian deaths in your garden then it is possible they have an infectious disease. Like all animals, amphibians suffer from infections as part of their normal lifecycles. A wide range of potential pathogens has been found in or on UK amphibians, including bacteria, protozoa, viruses, nematodes and leeches. Some pathogens have no discernable impacts, some lead to poor body condition, and some can cause mortality. The main concern is when there are repeated mass