

Toads on Roads: Guidance and FAQs for handling Common Toads



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In the United Kingdom, native amphibians are threatened by habitat fragmentation and destruction alongside disease, and these factors have previously caused population declines^{1,2}. Native common toads (*Bufo bufo*) are very particular about the waterbodies they breed in, and may migrate over long distances annually to reach them. Recent analysis of four decades of citizen science data indicates that British common toad populations have fallen by approximately 41 % since the 1980s³, but ‘Toads on Roads’, whereby volunteer patrollers help toads to cross roads during their breeding migration, can help conservation efforts^{4,5}. Froglife and ARG UK support these toad patrols, and this guidance has been created to answer questions from toad patrollers and provide further information on amphibian safety.

All references and further useful web links can be found at the end of this document.

How to handle toads?

Volunteer patrollers generally lift toads into buckets or other suitable ‘rescue containers’ to safely transport them across roads or cycle ways. Froglife is often asked about how best to handle the toads, and the following guidance takes note of the Animal Welfare Act (2006) which applies to adult vertebrates⁶, and the Amphibian and Reptile Groups UK (ARG UK) amphibian fieldworkers’ guidance⁷.

- During toad patrols, direct handling should be kept to a minimum (e.g. only lifting in and out of buckets), with animals retained in appropriate containers, for as short a time as possible.
- We recommend that powder-free vinyl gloves (in preference to latex or nitrile gloves) are used by everyone who will be handling toads as part of Toads on Roads.
- We also recommend that each patroller uses a single set of powder-free vinyl gloves at each site, and that these are then disposed of safely at the end of each patrol night.



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In an unexpected or unplanned situation, e.g. you encounter an animal on the road outside of the patrol, the need to rescue the animal and return it to a place of safety is the priority. In the case of amphibians, where vinyl gloves are not available, we recommend that hands are wetted by unchlorinated water⁸ before an amphibian is moved by hand to safety nearby. However, if that isn’t possible, clean bare hands may be used. If the animal is to be held captive for any length of time, ideally place it in a container until it can be released in a place of safety.

For more information please refer to Appendix 1.

How to reduce stress to toads during Toads on Roads patrols?

On a busy patrol night multiple toads are often placed into the same bucket to transport them safely across roads during toad patrols. Therefore, consideration should be given to the number of animals

in each bucket to avoid risk of injury to them. If number of buckets becomes a limiting factor, then please refer to the ARG UK 100% fund (<https://www.arguk.org/arg-resources/100-fund>), who may be able to support your patrol with this.



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- We recommend that numbers of toads in each bucket are kept to a minimum where possible and that once the bottom of the bucket is full (around ten toads per bucket) the toads are released to limit the possibility of discomfort to the animals. Toads should not be placed on top of each other and when necessary, you should remind patrol volunteers that the welfare of the animals on release is as important as their rescue.
- For each bucket you should make a note of the number and sex of the toads, and release them in the nearest safe location (e.g. the other side of the road), ensuring you pass your records to the patrol leader on the night, so that accurate totals can be recorded.
- Toads should be held in buckets for as short a time as possible to reduce disruption to their breeding migration, e.g. only whilst safely moving toads off the road.
- Toads should not be transported over longer distances (e.g. in vehicles) to other waterbodies. Ideally, they should only be transported over the shortest possible distances to reduce disorientation, and so that they can naturally resume their breeding migration.

Should species/sexes be separated into different buckets?

During toad migrations toads may travel individually or sometimes pair up in 'amplexus' on route. Male toads maintain a tight grip on their partner, and at breeding ponds 'mating balls' can sometimes occur, whereby multiple males compete for one female, which can occasionally result in the death of the female (by suffocation or drowning). It is therefore important not to mix single males and females whilst transporting them in buckets to minimise this behaviour, which also disrupts natural mating processes. We also suggest putting pairs in amplexus in a separate bucket from single male toads.



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- We recommend that patrollers carry two buckets, one for female toads or toads in amplexus and one for male toads and other species. This avoids the risk of creating a mating ball with large numbers of males clinging to females before they are released. Whilst it may be difficult to sex toads accurately on a dark night, the males tend to be a smaller, and have dark 'nuptial patches' on their thumb and forefinger, to aid them with gripping onto the female. Males will also make a loud 'peeping' noise if another male touches them, which literally means 'get off'.
- Patrollers should not attempt to separate toads in amplexus, as this can lead to injury (of the toads!) and it is best to leave them as found.

Toad patrols were primarily created for toad safety during breeding migration. However, other amphibian species such as frogs and newts, are often seen on roads during the patrol season.

- Patrollers should be careful when mixing different species within the same bucket, e.g. take care not to carry buckets with small newt species and a 'full' bucket of toads to avoid the risk of the smaller species being crushed.

How to reduce chance of disease transmission during toad patrols?

Infections such as ranavirus, bufonid herpesvirus, toadfly and chytrid fungi (specifically *Batrachochytrium dendrobatidis*) have been recorded in wild amphibian populations in the UK⁹. Some of these infections are spreading and chytrid fungi have caused population declines and extinctions around the world⁹, so biosecurity measures are vital for anyone in contact with amphibians to protect wild populations from further disease spread⁶. In addition to wearing gloves for toad safety and comfort, disinfection and cleaning of all equipment is essential for toad patrols to reduce the chance of disease spread during Toads on Roads.

- Ideally the toad patrol manager/coordinator (or delegated person) should issue clean buckets each evening, and these can be collected in at the end of the session. If purchasing buckets becomes a limiting factor, then please refer to the ARG UK 100% fund (<https://www.arguk.org/arg-resources/100-fund>), who may be able to support your patrol with this.
- Buckets, or other rescue containers, should be thoroughly scrubbed before the start of, and at the end of the toad patrol season, to remove any dirt or debris that could be harbouring disease which can survive over time, e.g. in soil, and be invisible to the human eye
- If a toad patroller volunteers at multiple toads on roads locations, they should have separate buckets for each site. If this is not possible, e.g. financially, then patrollers should ensure their buckets are cleaned every time they move between sites.
- Alongside buckets, patrollers should ensure their footwear is also cleaned between patrol sites and both before and after the patrol season to limit the spread of disease

In summary:

1. Ensure that all surveyors are aware of disease issues and welfare precautions. Some sites may already have risk assessments in place, so it is important to check for these before commencing patrolling.
2. Arrive at the site with clean footwear. Try to park on hard standing where possible. Do not park on soft verges where patrollers or toads may be walking or crossing.
3. After patrolling disinfect boots, waders, nets, buckets and anything else that has been in contact with amphibians or pond water. When disinfecting equipment during fieldwork the following will be required: bucket, brush, disinfectant, disposable or washing up gloves (to wear while disinfecting) and bin bags for waste. When making up bleach or disinfection solutions, pond water can be used so long as it contains little or no organic matter (this reduces disinfectant effectiveness).
4. Full cleaning guidelines for footwear and equipment can be found in the ARG UK advice note: [Advice note 4 \(revised\) - Amphibian Disease Precautions, A Guide for UK Fieldworkers.pdf - Amphibian and Reptile Groups of the UK \(arguk.org\)](#).

For disinfection, follow this procedure:

- Use a brush to scrub off any debris, plant fragments, mud etc and rinse with water (pond water will suffice)
- Disinfect using one of the following methods: Soak in a bleach solution (1 measure of household bleach to 9 measures water) for 15 minutes; OR a disinfection agent (as per supplier's instructions); currently Froglife uses Safe4 (or Virkon as a second option). Fabrics including those worn while doing amphibian fieldwork can be washed on a 40 °C cycle (with detergent, ensuring sufficient rinsing).
- Nets should be rinsed with clean water and sprayed with a disinfection agent. Then rinse with clean water and where possible, allow to dry for before next use.
- Keep any equipment (traps, net frames etc.) inside plastic bags or tubs during storage.

Ideally all used disinfectant solutions should be poured directly into a drain connected with the sewer system and flushed with clean water. In the field, pour onto an area of hard-standing, or similar un-vegetated area well away from the pond.

Any signs of disease, skin infections or malformations in toads or other amphibian species should be photographed and reported to the Garden Wildlife Health Project (GWH) using their portal here: <https://www.gardenwildlifehealth.org/>. Froglife is a partner of the GWH project, and reporting disease occurrence helps to track the occurrence and impact of disease on wildlife populations.

Further information:

- Toad Patrol resources: <https://www.froglife.org/what-we-do/toads-on-roads/toad-patrol-resources/>
- Handling amphibians: <https://www.froglife.org/2024/06/01/bare-hands-gloves-or-not-at-all-whats-best-for-amphibians-and-why/>
- Garden Wildlife Health: <https://www.froglife.org/what-we-do/the-garden-wildlife-health-project/>

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[advice/advice-notes/324-advice-note-4-amphibian-disease-precautions-a-guide-for-uk-fieldworkers-pdf-2](https://www.jncc.gov.uk/resources/advice/advice-notes/324-advice-note-4-amphibian-disease-precautions-a-guide-for-uk-fieldworkers-pdf-2)

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Appendix 1

The risk of transmission of disease such as ranavirus or chytridiomycosis (chytrid fungus) caused by *Batrachochytrium dendrobatidis* (Bd) and *Batrachochytrium salamandrivorans* (Bsal) between sites remains high as spores can survive on equipment, footwear or vegetation. Chytrid causes death by disrupting the uptake of salts through the skin, disrupting amphibian metabolism and ultimately stopping their hearts from beating (ARC, 2024). The 'perceived wisdom' is that handling with dry hands can damage the mucus layer on the skin, hence the need to wet either hands or gloves prior to handling an amphibian.

Varga *et al.* (2019) highlighted the value of amphibian skin as an 'innate immune organ' acting as the first line of defence against pathogens in an aquatic environment. Amphibians have a glandular network beneath their skin that produces antimicrobial and toxic chemicals which help protect the animal against pathogens and predators. Mucosal glands produce a mucus layer which protects the skins, maintaining elasticity, permeability and moisture on the skin surface (Varga *et al.*, 2019). Along with acting as a physical barrier between amphibians and their environment, the mucus layer is a matrix containing bacteria and antimicrobial, antibacterial, antiviral, antifungal or anti-parasite secretions from the animal itself. In many species the mucus also contains alkaloids, secreted as a defence against predation. Damage to this mucus layer can have an impact on animals; handling can remove the mucus layer and some chemical pollutants, such as pesticides, can damage skin mucus having a sub-lethal effect on amphibians in both larval and adult forms.

A recent review by Woodhams *et al* (2023) considered the 'adaptive microbiome hypothesis' arguing that amphibians, like other vertebrates (including humans) have large numbers of bacteria on their skin. Previously, Rollins-Smith (2009) found beneficial bacteria within the skin mucus of amphibians produce antifungal compounds which inhibit the growth of Bd and suggested that bio-augmentation could be a future possibility to protect highly endangered species. Woodham's (2023) review found evidence that while Bd was increasingly virulent as it passed through Central America; in Panama, amphibian 'mucosal skin defences' were higher after the disease appeared, indicating a possible response by amphibian populations as their microbial community evolved to combat Bd. The hypothesis proposed suggests that on recovery from an initial infection, the microbial community can better combat subsequent exposures. This could also explain why some amphibians can operate as carriers of Bd and Bsal fungus while others suffer significant mortality on exposure.

In 2010 Phillott *et al.* highlighted the need to minimise exposure of amphibians to pathogens during any form of field study, emphasising the need for strict bio-security and hygiene when moving between sites, including:

- disinfecting footwear using sodium hypochlorite
- disinfecting equipment such as scales, callipers or containers

Phillott *et al.* (2010) also discussed the damage that can result from handling amphibians and identified a number of papers that found stressed animals had a greater risk of infection. Apart from the impact on their skin, handling amphibians can cause the stress, and repeated handling has been shown to impact their behaviour. Bliley and Woodley (2012) studied the impact of repeated handling in a species of salamander and found that repeated handling reduced feeding behaviour in females and activity in both males and females. They argued that stressed animals may even avoid reproduction and divert energy into immediate survival.

Phillott *et al.* (2010) argued the direct transfer of microbes and spores between animals can be reduced by using single-use gloves. Importantly, they highlighted previous work that found some tadpoles suffer lethal and sublethal effects when exposed to latex (Gutleb *et al.* 2001) and nitrile and to a lesser extent vinyl so larvae should only be handled with gloves that have been proven safe for that species or with hands wetted by water from the source pond. They argued that when gloves are not available, hand washing with 70% ethanol allowing the hands to air dry between handling is an alternative. If this is not possible in the field, 'hand washing in the water body to which the amphibian is naturally exposed' is the best alternative (Phillott *et al.* 2010). Laboratory tests by Gray *et al.* (2018) found that not changing gloves between individual tadpoles resulted in the transmission of ranavirus, increasing tadpole mortality by a factor of 30.

There seems to be some variation in the impact of gloves; Mendez *et al.* (2008) found that water washed from nitril gloves killed Bd spores on contact while latex and polyethylene gloves had no effect. It is important to note the effect of vinyl gloves varied with brands and batches. Human skin also demonstrated a fungicidal effect on Bd, possibly due to the presence of antifungal peptides on the skin surface. They recommended that to minimise the risk of transfer of disease between individuals single use disposable gloves were the best option followed by bare hands as a preferable alternative to continual use of the same pair of gloves (Mendez *et al.* 2008).

A more recent study (Thomas *et al.*, 2020) evaluating the impact of nitrile and vinyl gloves on Bd and Bsal found glove 'rinsewater' led to a reduction in Bd and Bsal spore production compared to water alone. They recommended:

- the single use of nitrile gloves should be advocated to handle amphibians.
- at a minimum gloves should be changed between each population
- the repeated use of the same pair of gloves should be preferred above handling animals bare handed

So we know the value of the mucus layer on the skin of an amphibians and we understand the risk of damaging that skin, disrupting the animal's immune defences. We are also aware of the risk of disease transmission from animal to animal if we handle multiple animals in the field. There remains a dilemma as to which advice to follow; the 2017 guidance aligns with the most recent experimental work but how does a toad patroller change their gloves between each animal and still manage to collect the animals before they reach the road verge?

We have to agree a sensible approach; animals in the same population share the risk of disease transfer within their aquatic environment and so the existing 2017 ARG Advice Note 4 appears to remain the most sensible approach to handling animals. However, on some occasions, if necessary, a hand dipped in the source water-body may do less damage than not moving the animal.

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