



Chytrid Fungus eDNA

Technical White Paper

Chytrid Fungus



The pathogenic Chytrid Fungi *Batrachochytrium dendrobatidis* (Bd) and *Batrachochytrium salamandrivorans* (Bsal) are the cause of the amphibian disease chytridiomycosis, which has led to the rapid decline of global amphibian populations. *Batrachochytrium salamandrivorans* mainly affects salamanders and newt species, the great crested newt (*Triturus cristatus*) in particular is highly susceptible to this pathogen. *Batrachochytrium dendrobatidis* is virulent in many amphibians, over five hundred species worldwide have been affected. Globalisation, the amphibian pet trade, and the introduction of non-native species such as alpine newts (*Triturus alpestris*) have contributed to the spread of this deadly disease.

Chytridiomycosis was first reported in the UK in the southeast of England in 2004 and has since been reported in a further nineteen locations across England, Scotland, and Wales. Bd has been detected in all native UK amphibian species with the exception of great crested newts which are more susceptible to Bsal. The highest number of infected individuals surveyed were found within a protected natterjack toad (*Epidalea calamita*) population. Bd has also been detected in non-native alpine newt and North American bullfrogs (*Lithobates catesbeianus*) populations within the UK.



Effects of chytridiomycosis on amphibians



Chytridiomycosis affects the skin of amphibians. Chytrid Fungus feeds on the keratin and other proteins in the skin leading to increased shedding and reddening. Bd disrupts the ion transport across the skin which results in cardiac arrest; Bsal creates small holes across the skin allowing bacteria to colonise the organs causing septicaemia. A majority of infections within a population can lead to 100% mortality of individuals.

Treatment of infected individuals is not currently possible in wild populations, therefore early detection of Chytrid Fungus is essential to prevent the spread of both Bd and Bsal to new areas and ensure protective measures are taken when working between sites inhabited by amphibians.

Traditional Survey Methods



Surveying amphibian populations for chytridiomycosis involves trapping individuals and swabbing the skin. At least thirty adult or juvenile individuals should be caught and swabbed on the same day to ensure confidence in disease detection. Surveys should be undertaken once in spring and again in summer.

Swabs are then sent for qPCR analysis.

This method of surveying requires a lot of equipment and prior training for staff and volunteers. Species protected under UK legislation such as natterjack toads and great crested newts will require a licensed surveyor to be present.

Environmental DNA survey method

Chytrid Fungus can survive in moist environments whilst waiting for a host. As all organisms shed DNA into the environment, water samples, from ponds for example, will contain DNA directly from Chytrid Fungus and in the skin shed from amphibians.

The environmental DNA survey method is non-invasive, water from ponds can be collected with no need to handle or disturb individuals, it requires less equipment and training than tradition methods and is less time consuming.

Sample collection and analysis

Our sample collection protocol uses a filter unit. Surveyors should collect a representative sample from the perimeter of a pond, for more information on sampling strategy see our detailed sample collection guide, which is included within each sample collection kit.

DNA is then extracted from the filter unit, positive and negative controls are used throughout the analysis to ensure accurate, reliable results.

Quantitative polymerase chain reaction (qPCR) is then carried out using a single species qPCR method allowing analysis of a single sample for either *Batrachochytrium dendrobatidis* (Bd) or *Batrachochytrium salamandrivorans* (Bsal) amplifying the DNA to a great enough extent that it can be detected using fluorescent imaging.

At SureScreen Scientifics we are able to test for both *Batrachochytrium dendrobatidis* (Bd) and/or *Batrachochytrium salamandrivorans* with an easy to collect eDNA sample. Visit our website to order your kit today. We are also able to provide laboratory swab testing for the presence of chytridiomycosis. If this is something which you are interested in, then please contact us for more information or to discuss the options available.



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