

What is *Sarcocystis*?

- Sarcocystis* parasites cause ‘rice breast’ disease in wildfowl, so called due to the distinctive lesions which appear as pale cysts, or rice grains, in muscle tissue.
- The lifecycle of these parasites involves wildfowl as the intermediate host and a carnivorous mammal, such as a fox, as the final host.

Why are we interested?

- Cases of rice breast disease noted by both WWT surveillance and UK wildfowlers appear to have been on the rise in recent years.
- Better surveillance was needed to determine whether this is an emerging infection, and its potential to impact individual fitness and populations.
- While *Sarcocystis rileyi* is the most commonly found species in North American wildfowl, the species causing infection in the UK was unknown.

Our work so far...

- In 2015, the UK Wildfowl *Sarcocystis* Survey was set up as a collaborative project between WWT, BASC, and the University of Liverpool, with additional input from the Royal Veterinary College in 2017.
- The aims of the project, so far, were to:
 - Study the number and distribution of *Sarcocystis* cases in the UK by gathering reports submitted by the wildfowling community via an online reporting system, www.sarcocystissurvey.co.uk.
 - Document the emergence of *Sarcocystis* infection in recent years by recording wildfowlers’ past experiences of the disease via a UK questionnaire survey.
 - Carry out DNA analyses of infected wildfowl tissue to determine which *Sarcocystis* species is present in the UK.
 - Investigate how *Sarcocystis* infection may affect bird fitness and health by studying tissue samples from infected wildfowl muscles.

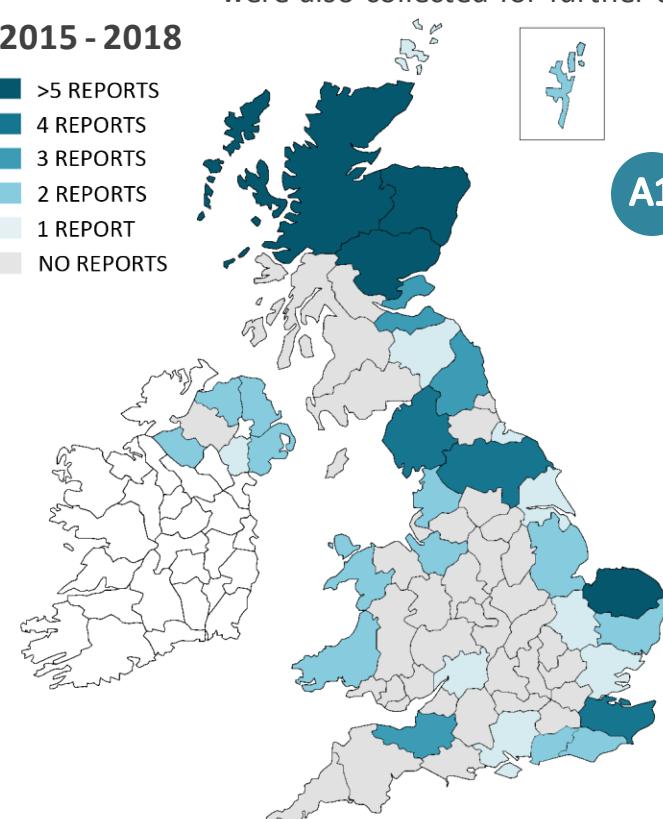
A

Online reporting

New cases of rice breast disease were reported via our website. Tissue samples were also collected for further analyses.

2015 - 2018

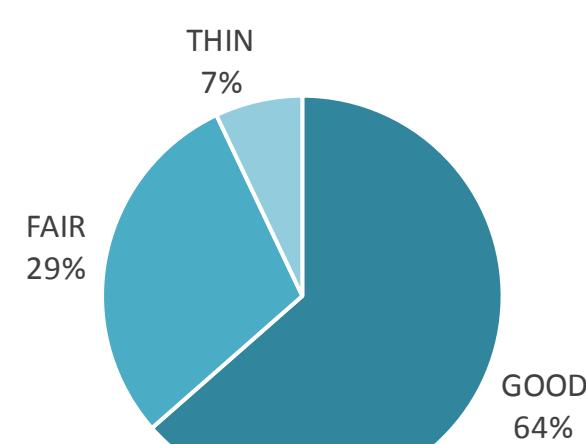
>5 REPORTS
4 REPORTS
3 REPORTS
2 REPORTS
1 REPORT
NO REPORTS



A1

GEOGRAPHIC DISTRIBUTION

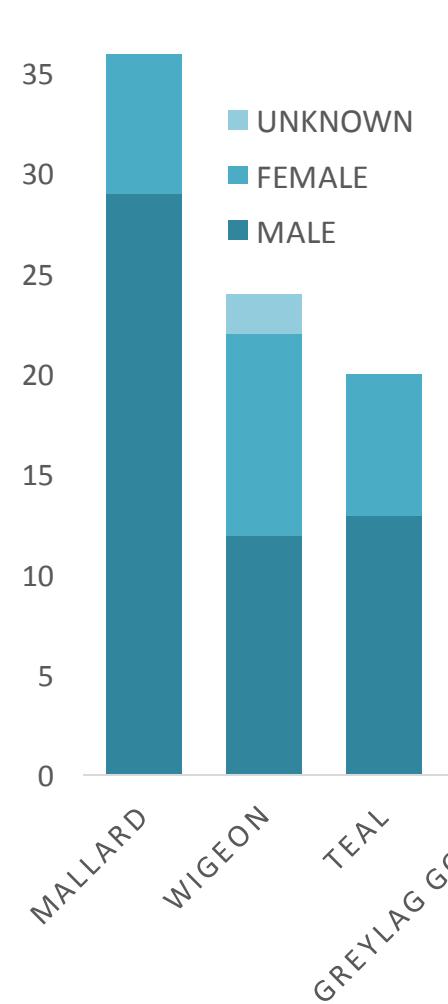
Distribution is widespread, with most cases in the Scottish Highlands, East Anglia and NW England. Whether this reflects shooting activity or parasite distribution remains to be seen.



A2

BODY CONDITION

Most infected birds were in good body condition despite their lesions, which could be good news for birds.



A3

SPECIES COMPOSITION

Cases were most common in mallard, wigeon, and teal (with a male bias), largely a reflection of bag size. Although wigeon seem over-represented?



90 reports

of rice breast disease have been submitted to the UK Wildfowl *Sarcocystis* Survey since winter 2015

B

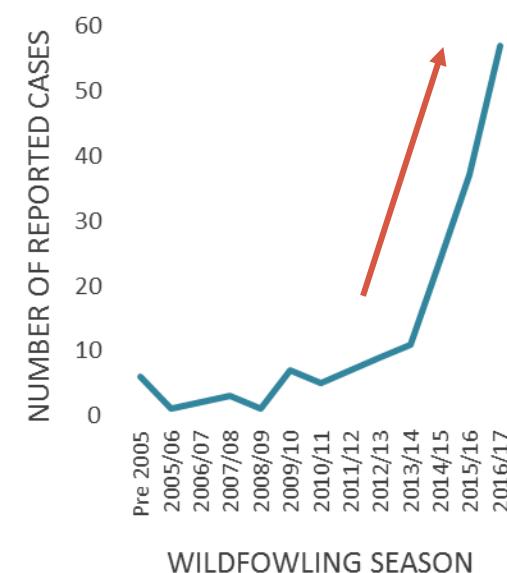
Questionnaire survey

The wildfowling community completed a questionnaire to record their past experiences, if any, of rice breast disease.

B1

HISTORICAL TRENDS

Reports increased from 2005 onwards, particularly since the 2013/14 season. The increase looks clear, although some also may reflect greater awareness.



A total of 211 cases were reported.

948 people responded to our questionnaire

14.35 % reported having seen *Sarcocystis* infections in wildfowl

2005 - 2017

>25 REPORTS
16-20 REPORTS
11-15 REPORTS
6-10 REPORTS
1-5 REPORTS
NO REPORTS



B2

REPORTED SPECIES

Cases were again most common in mallard, wigeon and teal, with a male bias.

Cases were also found in gadwall, tufted duck, pintail, goldeneye, Canada goose, pink-footed goose, and greylag goose.



B3

HISTORICAL DISTRIBUTION

Reports were widespread, mostly from the Scottish Highlands, East Anglia and Lancashire.

B4

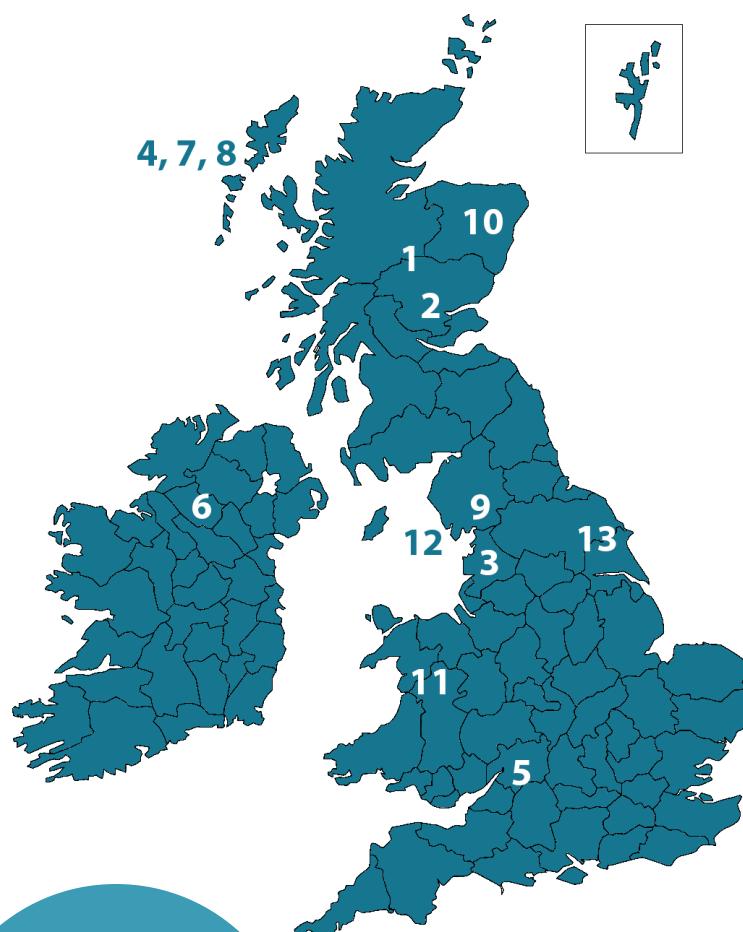
ANNUAL HARVESTS

Bigger harvests were associated with increased chances of observing rice breast disease in the field.



C**DNA analysis**

DNA analysis was performed to determine the *Sarcocystis* species responsible for UK infections.



13 tissue samples
submitted by
wildfowlers from
across the UK

D**Bird fitness**

Tissue samples were examined to find evidence of any abnormalities in the muscle, which could indicate an impact of *Sarcocystis* infection on bird health and fitness.

C1**TISSUE SAMPLES**

Tissues from mallard, wigeon, teal, gadwall, and pintail from across the UK were analysed.

C2**DNA SEQUENCING**

DNA extracted from tissue samples was sequenced and compared with other *Sarcocystis* sequences.

Sarcocystis rileyi was confirmed as the species involved in the UK. This is also the first time *S. rileyi* infection has been genetically identified in gadwall and pintail.

D1**MUSCLE WEAKNESS**

Muscle myopathy, a weakness in the muscle, was found in 5 samples. The remaining 7 birds showed no obvious abnormalities despite extensive infection.

D2**IMPACTS ON FITNESS**

The presence of abnormalities in the muscle of infected birds may have various consequences:

- 1 Infected birds may experience an impact on their health and fitness.
- 2 There may be an increased likelihood of birds being shot or predated.

S. rileyi

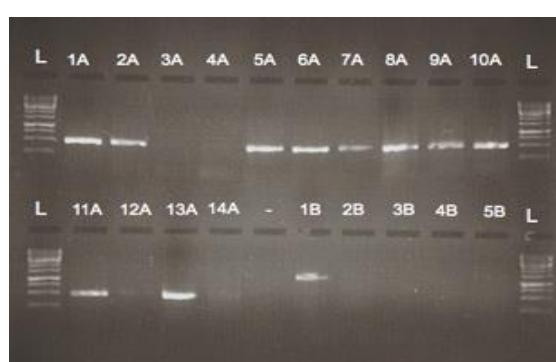
S. rileyi was confirmed as the species present in UK wildfowl

Spread of infection

assumed from north and east of UK

C3 S. RILEYI PHYLOGENY

Sequences from infected UK wildfowl matched *S. rileyi* sequences from Lithuania, Norway, Finland and the United States.



In the lab – DNA fragments extracted from tissue samples are visualised on gels, as seen above.



25µm

Under the microscope – muscle tissue showing damage caused by the *Sarcocystis* parasite.

What can we conclude?

- So far, we have been able to draw various conclusions from this collaborative project, namely:
 - A. *Sarcocystis* infection, or rice breast disease, appears to be increasing rapidly in UK, particularly in dabbling ducks.
 - B. The *Sarcocystis* parasite is the same species as that which is causing infection higher up the flyway, and UK cases are likely spread from northern and eastern Europe.
 - C. Although cases are often seen in birds still in good health, the parasite can cause muscle weakness with potential for affecting bird fitness.
- Understanding wildlife diseases requires multiple skills and partners for surveillance and research – from the field, to the lab, to the computer. This project represents an excellent collaboration between vets, parasitologists, conservation and shooting organisations, and crucially wildfowlers on the ground. We are very grateful!

What's next?

Please continue to report any cases of rice breast through the UK Wildfowl *Sarcocystis* Survey to help us build our understanding of the impacts of this disease on UK wildfowl.