

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.

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

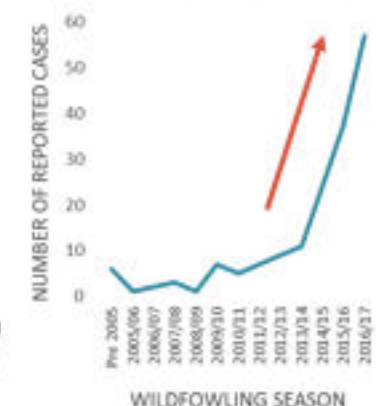
B Questionnaire survey

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

948 people responded to our questionnaire

B1 HISTORICAL TRENDS

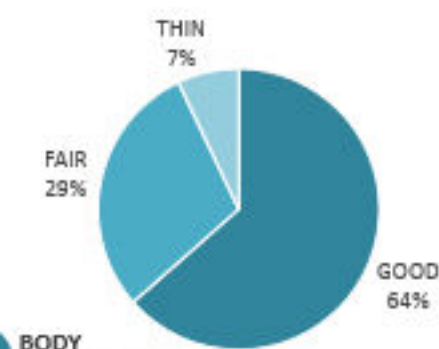
Reports increased from 2005 onwards, particularly since the 2013/14 season. The increase looks clear, although some also may reflect greater awareness.



14.35 % reported having seen *Sarcocystis* infections in wildfowl

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.

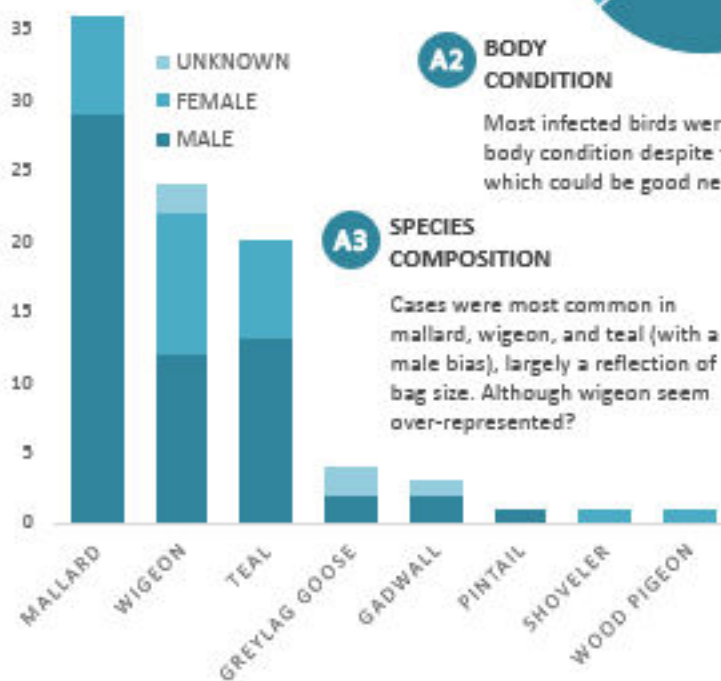


A2 BODY CONDITION

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

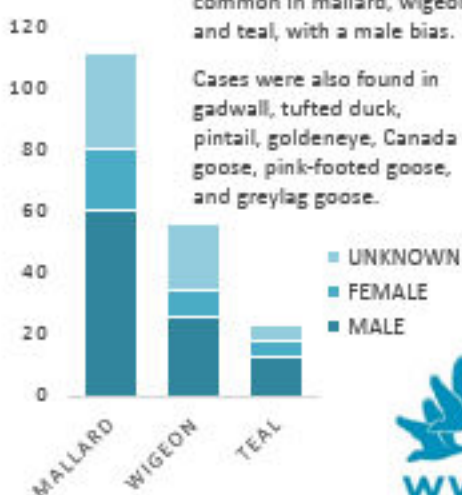
A3 SPECIES COMPOSITION

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



B2 REPORTED SPECIES

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



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.



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.



What can we conclude?

- So far, we have been able to draw various conclusions from this collaborative project, namely:
 - Sarcocystis* infection, or rice breast disease, appears to be increasing rapidly in UK, particularly in dabbling ducks.
 - 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.
 - 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!

13 tissue samples submitted by wildfowlers from across the UK

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.



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

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.

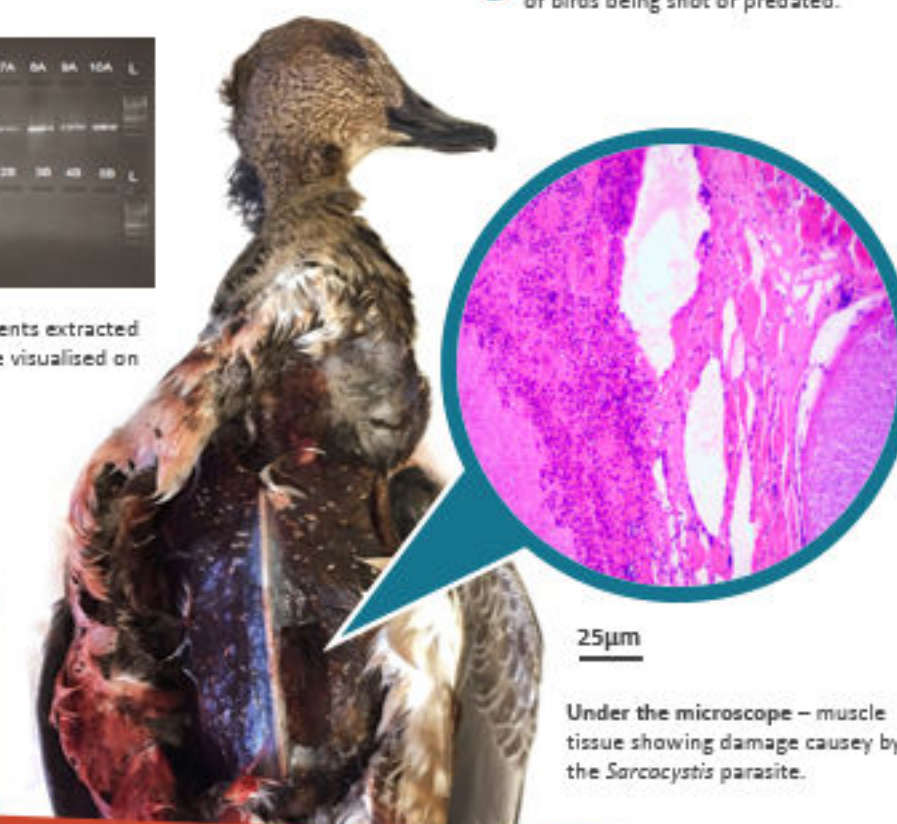
D1 MUSCLE WEAKNESS

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:

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



25µm

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

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.