Trichomonas gallinae infection in European Turtle Doves Streptopelia turtur in Africa and potential for transmission among co-occurring African columbiformes

A European Turtle Dove caught by the research team in Senegal. Photo © Jenny Dunn

Report for the African Bird Club on fieldwork in Burkina Faso and Senegal

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Project details

Supervisors

Dr Danaë Sheehan & Dr Jenny Dunn (RSPB Centre for Conservation Science, Sandy, UK)

Fieldworkers

Burkina Faso: Aly Issa & Oumar Issa (Fondation NATURAMA, Ouagadougou, Burkina Faso)
Senegal: Dr Jenny Dunn (RSPB Centre for Conservation Science) & Rebecca Thomas (School of Biology, University of Leeds, UK)

Qualifications of Fieldworkers

AI and OI were trained in the specific sampling techniques required by this research by DS, following detailed protocols drawn up by JD and RT. JD and RT had 7 and 1 years of bird handling experience respectively at the time of fieldwork, and both hold bird ringing permits from the British Trust for Ornithology (at ‘A’ and trainee levels respectively). JD and RT both have experience of carrying out the relevant sampling techniques in the United Kingdom under Home Office license and have undergone appropriate training.

Funders

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Permissions and in-country licenses

Research in Burkina Faso was carried out with the permission of the Director of Wildlife and Hunting, and research in Senegal was carried out under a permit granted by Direction des Eaux, Forêts, Chasses et de la Conservation des Sols. The British Trust for Ornithology (BTO) approved the use of BTO rings in Senegal. Samples were imported to the UK under Defra import licences PATH/201/2012/1 and PATH/201/2012/2.
BACKGROUND

*Trichomonas gallinae* is an emerging avian pathogen in the UK and across Europe, leading to population declines in songbirds (especially greenfinches *Carduelis chloris*) where prevalence is high (Robinson *et al.* 2010). The parasite is present worldwide, and elsewhere it is typically a pathogen of columbiformes, where it can have population limiting effects (Bunbury *et al.* 2008). Recent work has shown a high prevalence in UK columbiformes, with the highest rates of infection (86%) in the migratory European Turtle Dove *Streptopelia turtur* (Lennon *et al.* 2013). Infection by the parasite has also been associated with clinical signs of disease, and subsequent mortality in both adult and nestling Turtle Doves on UK breeding grounds (Stockdale *et al.* 2015). Infected individuals do not necessarily exhibit clinical signs, and carriers without clinical signs may transfer disease organisms between sites during migration (e.g. Rappole, Derrickson & Hubálek 2000) and exhibit reduced survival (Bunbury *et al.* 2008).

The European Turtle Dove is the UK’s fastest declining breeding bird species, with declines of 97% since 1970 and 91% since 1995 (Hayhow *et al.* 2015). These are paralleled by declines of 78% across Europe since 1980 (PECBMS 2015), leading to its classification as ‘vulnerable’ throughout Europe following a recent assessment (BirdLife International 2015).

European Turtle Doves breeding in the UK are thought to have a non-breeding range spanning much of the Sahel in West Africa, coinciding with the range of several species of Afro-tropical columbids. *T. gallinae* may be transmitted between infected individuals at shared food and water sources, with this being of particular concern at those sites utilised by large numbers of birds. Such events may be frequent in the Sahel, where birds congregate at scarce water sources in an otherwise arid environment. This leads to concerns that intra- and inter-species transmission rates may be high during the non-breeding period.
RESEARCH OBJECTIVES
1. To establish the prevalence of infection by *Trichomonas gallinae* in European Turtle Doves and co-occurring African columbiformes on African wintering grounds.
2. To determine which strains of *T. gallinae* infect Turtle Doves on wintering grounds, and identify likely infection routes through examination of sequence data and reference to a wider data set.

STUDY SITES AND FIELD METHODS
The original site that had been selected for this study, in the north of Nigeria, could not be used due to escalating security concerns in the region. Consequently, birds were sampled in Burkina Faso and Senegal (further details below). Doves – both migratory and resident species (further details below) – were caught using mist nets. Each bird was ringed using a metal ring (Ghana Ringing Scheme in Burkina Faso, British Trust for Ornithology in Senegal) fitted to the tarsus, and standardised biometrics (wing length, tarsus length, weight; Redfern & Clark 2001) recorded. In Senegal, for a subset of birds of each species, we also recorded whether the bird was actively moulting, along with the primary moult score (Redfern & Clark 2001) to allow us to assess whether delayed moult may be associated with parasite infection.

Doves were caught using two-shelf wader mist nets positioned near a water source in Senegal. Photo © Rebecca Thomas

*Burkina Faso*
The study site in Burkina Faso was located at Oursi, in the far north-east of the country (14.67°N, 0.46°W). Catching and sampling of turtle doves and other Afro-tropical *Streptopelia* species was carried out between October 2012 and Feb 2013 by Al and Ol, using mist nets erected at regularly used roost sites. Samples were collected from a total of 139 doves: 36 European Turtle Doves *Streptopelia*
tu<ti>rtur, 88 Laughing Doves *Streptopelia senegalensis*, 3 African Collared Doves *Streptopelia roseogrisea*, 4 Vinaceous Doves *Streptopelia vinacea*, and 8 Mourning Doves *Streptopelia decipiens*. These samples were imported to the UK in 2015 following an extended delay in obtaining an export permit and prolonged storage in sub-optimal conditions. Whilst initial analysis of samples has suggested that some are viable, the conclusions we will be able to draw from these are limited.

**Senegal**
The study site in Senegal was located approximately 6km to the south of Sandiara, to the south-east of Dakar (14.38°N, 16.81°W), within an area of enclosed acacia scrub where estimates placed the number of wintering European turtle doves at around 1000 individuals.

Outside (far left) and inside (right and front) the study area of enclosed acacia scrub in Senegal. Photo © Jenny Dunn

JCD and RCT visited the site for 12 days during late-February and early March 2014, with 6 species of dove observed to be using the site to roost (European Turtle Dove, Laughing Dove, Vinaceous Dove, Mourning Collared Dove, Namaqua Dove *Oena capensis* and Black-Billed Wood Dove *Turtur abyssinicus*). Doves were caught using a combination of two-shelf wader mist nets and four-shelf Japanese mist nets (whoosh nets with which to specifically target Turtle Doves had been lost by the airline on route) positioned near a water source where doves had been observed drinking in small flocks.
European Turtle Doves were observed in small flocks (left) near a water source (right) in Senegal where birds were caught using mist nets. Photos © Jenny Dunn

Samples were collected from a total of 130 doves of 5 species: 11 European Turtle Doves, 30 Laughing Doves, 1 Vinaceous Dove, 73 Namaqua Doves and 19 Black-billed Wood Doves. Two Namaqua doves and two black-billed wood doves were re-trapped within the capture period, but were not re-sampled.

Species sampled for *Trichomonas gallinae* in Senegal. Top left to right: Laughing dove, female Namaqua dove, Vinaceous dove. Bottom left to right: European Turtle dove, male Namaqua dove, Black-billed wood dove. Photos © Jenny Dunn

*Trichomonas sampling methodology*

All birds that were ringed were sampled for the presence of *Trichomonas gallinae* parasites by taking an oral swab as described by Lennon *et al.* (2013). This involved taking a swab of the surface tissue in the oral cavity, oesophagus and crop. Each swab was immediately used to inoculate a uniquely identifiable, individual ‘InPouch’ Culture kit (BioMed diagnostics, Oregon, US). Culture kits were then incubated for a minimum of 72 hrs at 37°C before the parasites were isolated and stored in PBS prior to export to the UK.
ANALYSIS OF TRICHOMONAS SAMPLES
Funding from the NERC Biomolecular Analysis Facility at the University of Sheffield was obtained in late 2014 to cover costs of laboratory analysis, completion of which is anticipated in late 2016. Initial analysis suggests a Trichomonas prevalence of 100% in Turtle Dove samples from Senegal and 77% in Burkina Faso. However, the estimate from Burkina Faso is likely to be an underestimate due to suboptimal storage conditions. Further analysis will examine genetic strain identity of Trichomonas in samples from all species, as well as establishing prevalence estimates in Afro-tropical columbid species. Results will be presented in a paper which is expected to be submitted for publication in early 2017.

REFERENCES