Newcastle disease virus transmission dynamic in wild peridomestic birds in the United Arab Emirates

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Introduction and objectives

Pathogen dynamic in a population = individual changes of infection status over time

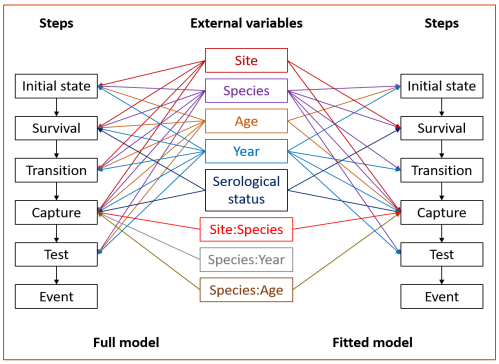
Challenging in wild animals: difficult to trap and sample + imperfect diagnostic methods (Choquet et al. 2013).

Multi-event capture-recapture (MECR) models → analysis of longitudinal capture data of individuals whose infectious status is assessed using imperfect tests (Conn and Cooch 2009; Cooch et al. 2012).

Data: longitudinal field study of **peridomestic wild birds** in the United Arab Emirates + serological testing for **Newcastle disease virus** (NDV) (Hirschinger et al. 2019)

Goals: estimate demographic and epidemiological parameters of the disease

Materials and methods



- 2 breeding sites (NARC and SKHBC-AD)
- 2 years (Jan 2016 to Dec 2017)
- 6 species

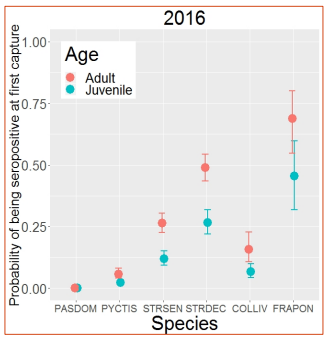
- Capture-Recapture
- Serological screening for NDV (ELISA)

- MECR model

Figure 1. Model's structure and tested external variables for the full and the best-fitted models. The ":" means that adjacent variables were tested in interaction.

Results

Newcastle disease dynamic



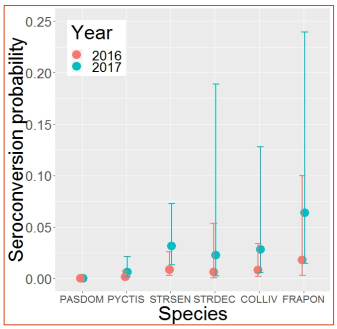
Seropositivity probability depended on :
- bird **species** (max in FRAPON)
- **age** of individuals (lower in juveniles)
- **year** of sampling (lower in 2016)

Figure 2. Probabilities of being seropositive at first capture for each bird species according to the age of the individuals in 2016. Error bars represent 95% confidence intervals.

Seroconversion probability depended on :
- bird **species** (max in FRAPON)
- **year** of sampling (lower in 2016)

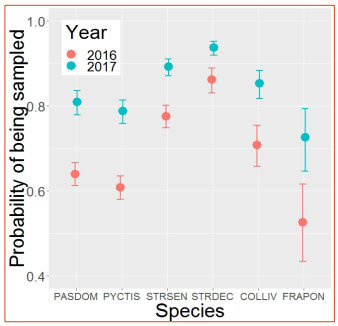
Seroreversion probability negligible

Figure 3. Probabilities of seroconversion for each bird species according to the year of sampling. Error bars represent 95% confidence intervals.



Probability of being sampled

Performances of the test



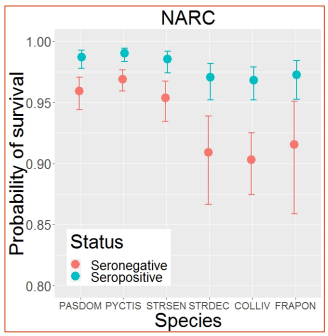
Sampling probability depended on :
- bird **species** (max in STRDEC)
- **year** of sampling (lower in 2016)

Test performances :
- specificity 0.97 (95% CI: 0.96 - 0.98)
- sensitivity 1.0 (95% CI: 1.0 - 1.0)

Figure 4. Probabilities of being sampled for each bird species according to the year of sampling. Error bars represent 95% confidence intervals.

PASDOM House sparrow | PYCTIS White-eared bulbul | STRSEN Laughing dove | STRDEC Collared dove | COLLIV Rock feral pigeon | FRAPON Grey francolin

Survival and recapture probabilities

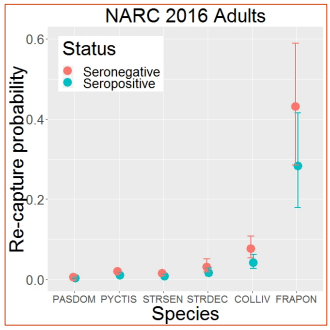


Survival probability depended on :
- bird **species** (max in PYCTIS)
- **serological status** of individuals (lower in seronegative individuals)
- sampling **site** (lower in SKHBC-AD)

Figure 5. Probabilities of survival for each bird species according to the serological status of the individuals on NARC. Error bars represent 95% confidence intervals.

Recapture probability depended on :
- bird **species** (max in FRAPON)
- **age** of individuals (lower in juveniles)
- **serological status** of individuals (lower in seropositive individuals)
- **year** of sampling (lower in 2017 than in 2016)
- sampling **site** (lower in NARC)

Figure 6. Probabilities of being re-captured for each bird species according to the serological status of the individuals in adults on NARC in 2016. Error bars represent 95% confidence intervals.



Conclusions and Implications

- **NDV** is **circulating continuously** in this community, with **spatial** and **temporal variations.**
- Wild **galliforms** and **columbids** are likely to act as **maintenance hosts.**
- **Adult individuals** of these species are **priority targets** for NDV surveillance.
- **Capture method** is **biased** toward seronegative individuals so it can not be used alone as part of capture-and-cull control strategy.

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