Pleydell et al.: A Bayesian analysis of birth pulse effects on the probability of detecting Ebola virus in fruit bats

October 2023

General Comments

This paper presents a fascinating epidemiological model of Ebola virus transmission in fruit bats in Cameroon, accounting for the dynamics and age structure of the population. This mechanistic model is fitted to a dataset previously collected by Djomsi et al., and bring several interesting results. It allows to estimate numerous central epidemiological parameters (recovery rate, duration of antibodies following infection, maternal antibodies, etc.). It also allows to understand the short-term and long term seroprevalence dynamics and their relationship to population dynamics (in particular birth and maturation pulses). Interestingly, it shows that the annual peak in infectious adults fall at about week 31, and that it is virtually impossible not to sample an infectious adult in the Djomsi et al. study, despite the fact that in this study PCR did not allow to detect any infectious adult. The authors suggest many possible explanations to this apparent discrepancy.

I am impressed by the amount of work carried out to develop and fit this model. I found this paper very interesting and well written. Although I am not familiar with this kind of epidemiological model, I found their explanation very clear and managed to follow closely their rationale. Therefore, I only have a small number of very minor comments.

Minor Comments

- My main comment is related to a choice of notation that would require some clarification in my opinion. Indeed, the notation S_A in the section "Mechanistic model" corresponds to the number of susceptible adults in the population. This notation is also used just before equation 22 to describe the survival over one year of adults. In equation 22, it is also used to describe $S_A(t)$, the survival probability which implicitly depends

on time (i.e. the survival probability over time t). I think that using the same notation for so many different concepts can confuse the reader (actually, it did in my case). I would suggest to (i) use different notations for survival probabilities and number of susceptible adults, and (ii) use different notations when a survival probability describes the survival over one year and when it describes the survival over a time-lag (or maybe use a common notation $S_A(t)$ with $S_A(52)$ corresponding to annual probabilities).

- I would be curious to know approximately the duration of the MCMC simulations (40 million iterations).
- Section "Probability of not sampling an infectious bat. The model identify a high probability of infectious individual around week 31 (thus end of July). The authors may wish to note that this date is very consistent with table 1, where a simple visual examination suggests that the proportion of positive animals increase suddenly increases at this approximate date (July 17).
- I noted that the survival probability of animals did not depend on whether they were infected by Ebola virus or not. I am not a specialist of Ebola: is it a reasonable assumption?