Are communities rich in ecological functions favouring diseases transmission in return?

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Abstract

Ecosystem services are ecosystem processes that directly or indirectly benefit human well-being. In the last decade, increasing research aimed at identifying and quantifying them, as a first step towards management and maintenance of these services and the protection of the species behind them. Although birds are the best-known class of vertebrates, occurring world-wide in nearly all types of habitats and filling many ecological roles, little research has been done on birds in an ecosystem services context. They were however shown to provide a wide range of ecosystem services, such as, among others, pest control, seed dispersal, pollination, nutrient and biogeochemical cycling or recreational hunting. Highly mobile, they act as mobile links that transfer energy both within and among ecosystems, thus contributing to ecosystem function and resilience.

A largely overlooked service is that of disease control. Scavengers are obviously of importance, but more generally the community composition plays a crucial role in the success of multi-host pathogens, through for example variations in host susceptibility, exposition or abundance. While the classical ecosystem services can be investigated using ecological functional groups, this second aspect requires another approach. We propose to use epidemiological functional groups, i.e., to group species depending on their function in parasite epidemiology (e.g., parasite introduction, parasite maintenance). Such groups are mostly based on birds’ ecology as their behaviour (e.g., foraging, movements) largely determines their infection risk.

In this study, we investigate the ecological functional richness and epidemiological functional richness of wetland-associated bird communities and their spatio-temporal variations in five geographically distinct sites in southern Africa. Bird census data were collected using standardised point counts from February 2007 to March 2010. Counts were realised every two or four months, totalising 3078 point counts and a record of 385 different species. We defined ecological functional groups thanks to former studies on waterbirds. Epidemiological functional groups were defined thanks to ecological data from both former studies and our own data. The epidemiological functional group approach is applied to the avian influenza virus and to avian malaria, both of serious economical and public health importance and good examples of different transmission routes (i.e., direct and vector-borne transmission, respectively). This work aims at providing more data on an expanding area of research as well as offering a novel approach of the role of host community composition on the transmission and persistence of parasites. We finally raise the important question of the existence of potential trade-offs between ecosystem services: are communities rich in supporting and provisioning ecosystem services in return communities favouring diseases transmission?

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