

Quantifying demographic contributions to helminth transmission dynamics in wild sheep

The Soay sheep on the Scottish island of Hirta are an unmanaged population that has been extensively studied for a number of decades, and thus provide an ideal system in which to study natural host-parasite dynamics in a large herbivore species. Identifying the key demographics of lambs, reproductive and non-reproductive females, and males, in which we are likely to see between-group variation due to differing seasonal pressures (e.g. giving birth, rutting, etc.), we developed a demographic model of helminth transmission. We then used multi-chain Monte Carlo simulation to fit this model to several years of annual host population counts and seasonal parasite counts from faecal sampling. Thus we were able to estimate variation in parasite transmission rates between the different demographic groups and across different years, thereby providing insight into the key drivers of infection in the Soay sheep population. More generally, we show that such combined data and modelling approaches are a flexible and effective means by which to understand host contributions to parasite transmission at the population scale.