Structured decision-making: a tool for disease risk analysis and management planning in the face of uncertainty

There is scope to better integrate disease risk analysis (DRA) in wildlife conservation planning. DRA helps identify risks of disease to wildlife, domestic animals and humans. However, its utility can be compromised because of uncertainties around the impact of infectious agents and their proposed management on conservation objectives. Structured decision-making (SDM) provides a management decision-making framework whereby alternative actions are evaluated against fundamental project objectives, i.e. the key outcomes of concern. We used a combined DRA and SDM approach for Madagascar pochard (*Aythya innotata*) reintroduction. A preliminary DRA identified *Pasteurella multocida*, cause of avian cholera (a common disease in domestic poultry in Madagascar), as a potential but unquantified threat to released pochards. Through SDM, we aimed to determine optimal management approaches to this hazard, alongside evaluation of the wider translocation strategy.

A multi-disciplinary expert group refined the fundamental project objectives, which included maximising pochard population establishment and welfare, and used an age-based population model and quantitative welfare scale to predict outcomes with respect to these objectives. Predictions were elicited concerning the likelihood of pochard exposure to *P. multocida* and the consequences of associated disease on population establishment and welfare under different management strategies. Management alternatives such as 'ring vaccination' of local poultry, and vaccination and corralling of pochards in the event of an outbreak, were predicted to reduce pochards' likelihood of exposure to the pathogen and improve establishment and welfare, but these outcomes were uncertain. Clearly presenting the uncertain predicted outcomes across alternative management actions allowed project managers to more easily interpret expert knowledge and therefore judge risks and benefits against fundamental project objectives.

DRA combined with SDM enabled effective integration of disease considerations in translocation planning. Other benefits of this approach included strengthening team cohesion, truly multidisciplinary working, and the explicit consideration of welfare outcomes in project design.