DO EXPERTS KNOW ANYTHING ABOUT BIRDS AND GRAZING? A BAYESIAN APPROACH USING EXPERT OPINION

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Extended Abstract

One of our greatest challenges as researchers is predicting impacts of landuse on biota and predicting the impact of livestock grazing on birds is no exception. Insufficient data and poor survey design often yield results that are not statistically significant or difficult to interpret because researchers cannot disentangle the effects of grazing from other disturbances. This has resulted in few publications on the impact of grazing on birds alone.

Ecologists with extensive experience in bird ecology in grazed landscapes could inform an analysis when time and monetary constraints limit the amount of data that can be collected. Using responses from twenty well-recognised ecologists throughout Australia we capture this expert knowledge and incorporate it into a statistical model using Bayesian methods (Figure 1, pooled expert results for nine bird species). Although relatively new to ecology, Bayesian methods allow straightforward probability statements to be made about specific models or scenarios and they allow the integration of different types of information, including scientific judgement while formally accommodating and incorporating the uncertainty in the information provided.

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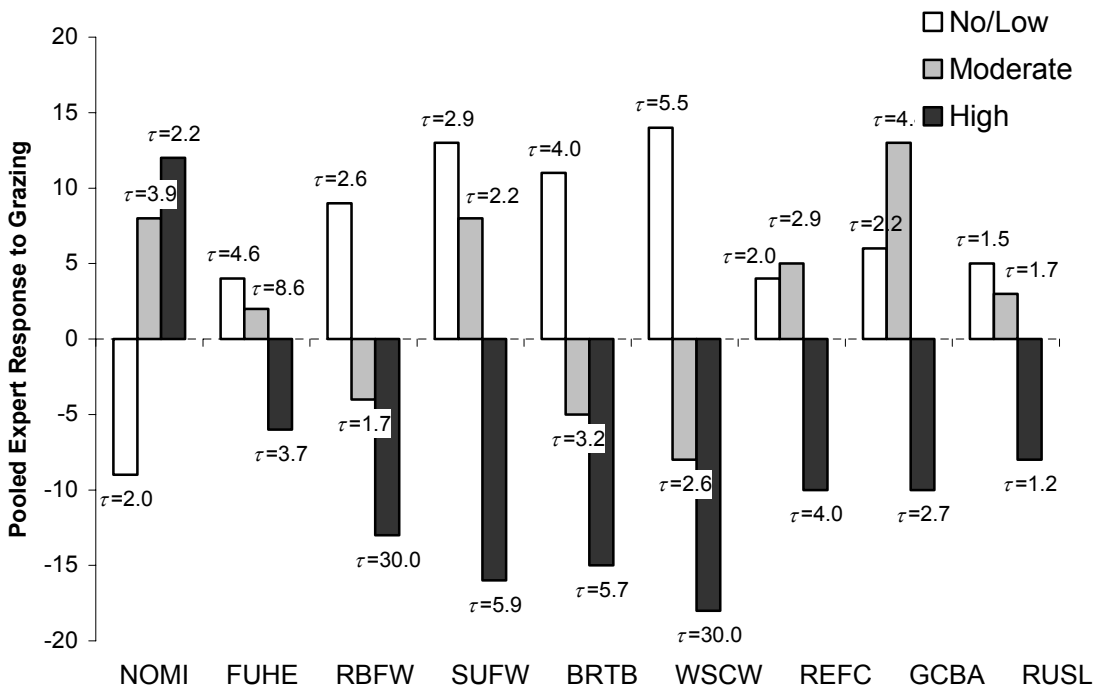

Figure 1. Pooled expert opinions on bird response to grazing for nine species. Each bar represents the mean as reported in Table 3 with precision (τ), shown at the end of each bar. The line at zero represents the belief that a species will show no response to a particular grazing level, whereas bars above the line indicate an increase in response to the grazing level and bars below the line indicate a decrease in response to the grazing level. NOMI (Noisy Miner), FUHE (Fuscous Honeyeater), RBFW (Red-backed Fairy-wren), SUFW (Superb Fairy-wren), BRTB (Brown Thornbill), WSCW (White-browed Scrubwren), REFC (Restless Flycatcher), GCBA (Grey-crowned Babbler), RUSL (Rufous Songlark).

Data on bird density (Figure 2) was collected across three broad levels of grazing (no/low, moderate and high – defined in Table1) typical of sub-tropical Australia.

Table 1. Three levels of livestock grazing examined

	Grazing intensity
1	Low/No Grazing: (Exclosures, stock routes) - Land use indicative of a history of no, little, or infrequent grazing, grass swards are intact.
2	Moderate grazing: (In paddock) - large tussock grass structure present indicating selective grazing.
3	High grazing: (In paddock) - closely cropped, lawn-like areas indicating non-selective grazing.

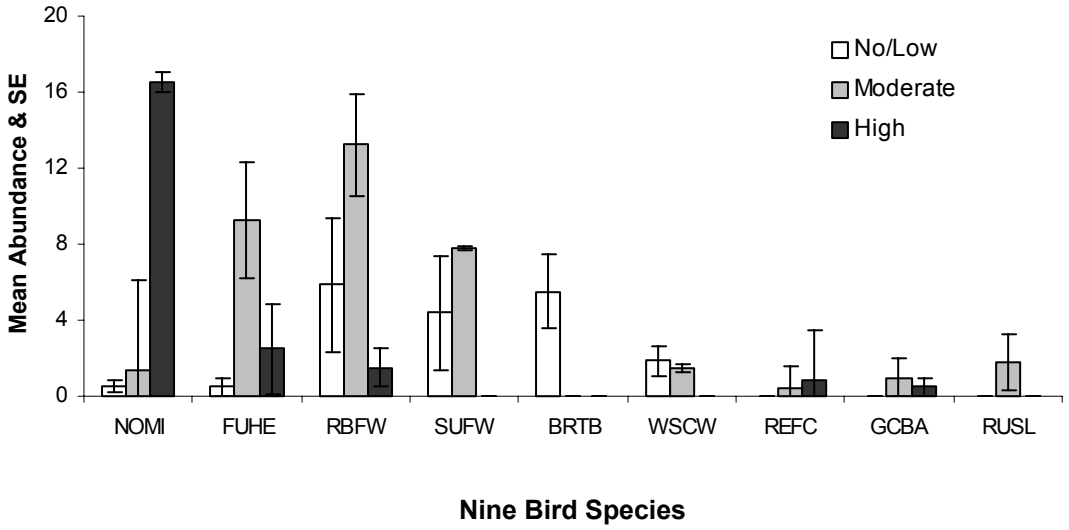

Figure 2. Mean abundance as observed from the field data plus or minus 1 standard error (SE) for nine bird species across three grazing levels, no/low, moderate and high. Species codes are defined in caption of Figure1.

This field data was used in conjunction with expert data to produce estimates of species persistence under grazing. The addition of expert data through priors in our model strengthened results under at least one grazing level for twenty-nine of the thirty-one bird species examined (Results for nine species are shown in Figure 3). When experts were in agreement with one another and the field data credible intervals were tightened substantially (Figure 3, WSCW – high grazing), whereas when experts were in disagreement results were similar to those evaluated in the absence of expert information (Figure 3, RUSL).

Financial and logistical constraints impair our ability to sample over large geographic areas and long time frames resulting in few long-term ecological datasets. In situations such as this, expert knowledge can be used to capture information beyond the study region and is the culmination of many years experience. Using expert data in combination with our field study enabled us to gain a greater insight into the overall impacts of livestock grazing on birds than we would have in the absence of expert information. In fields where there is extensive expert knowledge, yet little published data (e.g. rare species) the use of expert information as priors for ecological models is a cost effective way of making more confident predictions about the effect of management on biodiversity.

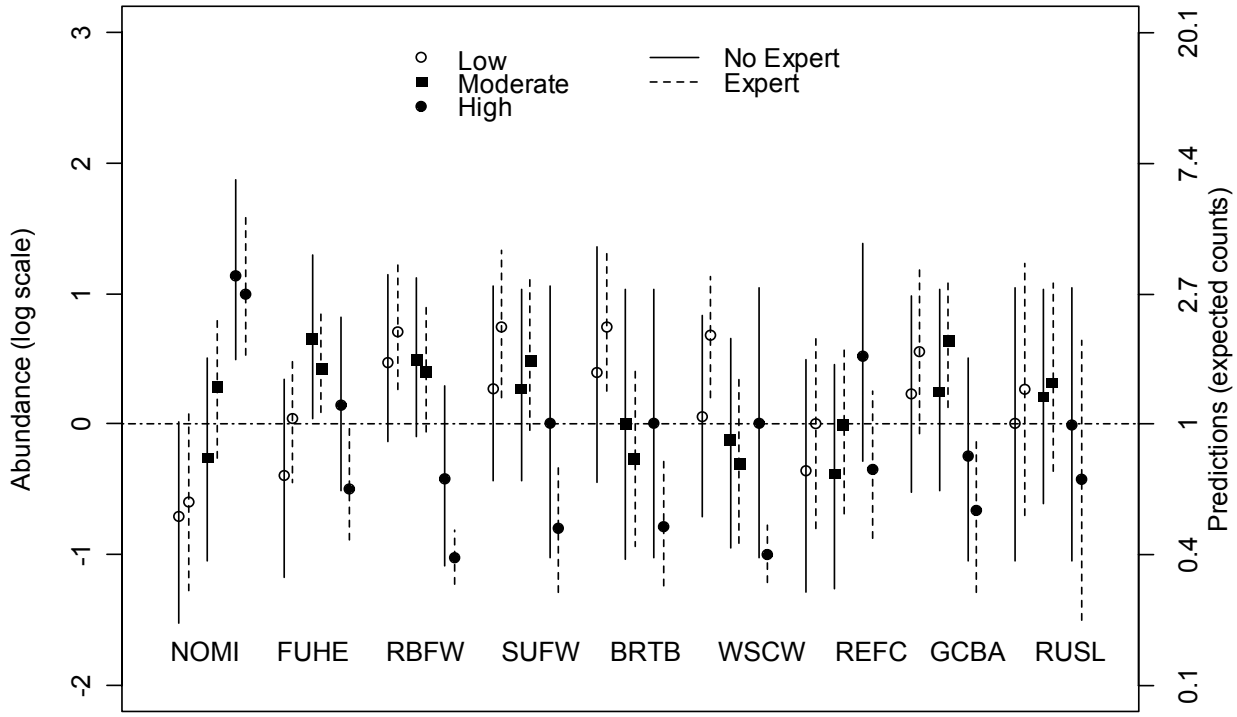

Figure 3. Comparison of Two-component model predictions of abundance and 95% credible intervals for nine species without and with expert information, for low, moderate and high grazing. Species codes are defined in caption of Figure1.