

*Conservation Biology*

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Dear Professor Burgman,  
Please find attached our submission “Estimating the footprint of pollution on coral reefs using models of species turn-over” to Conservation Biology’s *Contributed Papers* section.

Estimating the impacts of human disturbances on ecological communities is of fundamental importance to environmental impact assessment. For instance, models that estimate the footprint development are often used to compare the benefits of alternative conservation interventions. A challenge in estimating the footprint of human disturbances on communities is that ecological data are typically high dimensional (numerous taxa) and patchy in space. Here we show how joint models (also known as multi-species distribution modelling) can be used to estimate the spatial footprint of pollution impacts to a coral reef community.

Using a case-study from Solomon Islands, where there is a gradient of logged to unlogged islands, we show that the areal extent of turbidity impacts to coral reefs can be estimated from gradients of turn-over in benthic community composition. Our new method makes several important advances over earlier applications of multivariate statistics to impact evaluation. Importantly, our method enables direct predictions of abundances of benthic community members, along with uncertainty in their responses to the turbidity. Doing so means we can interpolate impacts to un-sampled reefs and gain an estimate of the areal footprint of logging impacts. We also show how the method can be used to evaluate the impacts of new illegal logging in the region, which is important information for formulating conservation interventions.

We believe this article will be of great interest to both academic and applied readers of Conservation Biology. Currently, developments in joint modelling have primarily been used to address ecological questions, so we wish to introduce the conservation community to this useful technique. We also modify existing joint models to make them more appropriate to the conservation community. In particular, we provide a means to estimate the footprint of human disturbances directly from ecological data. Estimates of the human footprint are very useful both for evaluating the past impacts of human disturbances and for assessing potential future impacts during the design of conservation interventions.

Yours sincerely,



Dr Christopher Brown and on behalf of Richard Hamilton

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