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| Zurich, 8 June 2020 | |
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Dear Prof. XX,

I am submitting the manuscript entitled ‘*Bound Within Boundaries? How Well Do Protected Areas Match Movement Corridors of Their Most Mobile Protected Species?*’, co-authored by Dominik Behr, John W. McNutt, Arpat Ozgul, and Gabriele Cozzi, for consideration for publication in *Journal of Applied Ecology*. All authors have seen and approved the manuscript and declare no conflict of interests. The manuscript in any form has not been submitted or published elsewhere.

In recent decades, the protection of large natural or semi-natural areas has become a key strategy to maintain and restore connectivity among animal populations. Boundaries of such protected areas are often based on expert opinion and socio-political needs, yet they are only rarely empirically verified. This is largely owed to a lack of appropriate movement data of those species for which the areas have been set. Especially movement data during dispersal, the phase most relevant to connectivity, are difficult to collect and remain scarce. In this study, we collected dispersal data of the highly endangered African wild dog and exemplify how such data can be used to verify the adequacy of protected areas. To achieve this, we quantified habitat preferences of dispersing wild dogs and further used this knowledge to predict landscape permeability across the world’s largest transboundary conservation area, the Kavango-Zambezi Transfrontier Conservation Area (KAZA-TFCA) in southern Africa. Finally, we calculated least-cost paths and corridors, and we verified that these were contained within the boundaries of the KAZA-TFCA.

Our approach carries several peculiarities that, in our opinion, levitate its value beyond comparable studies. Firstly, we made use of data collected exclusively during dispersal. This implied a heavy cutback in available data, yet we think it improved the accuracy of resulting model estimates. Moreover, we conducted our analysis on a massive extent, as we considered the entire KAZA-TFCA as our study area (approx. 520’000 km2). We did so to minimize edge effects and to provide a “bigger picture” of the adequacy of such initiatives. We collected environmental data that are readily available on a global scale, implying that future studies could easily adapt and expand a similar framework to other species and regions. Furthermore, our study area included the highly dynamic Okavango Delta, for which we created an algorithm to automatically remote sense flood-levels. This opens the door to further examine the importance of dynamically representing environmental features. With respect to modelling, we applied a recently proposed approach to conduct mixed effects conditional logistic regression analysis for multiple individuals. The method delivers more accurate, yet less significant results than earlier methods. Furthermore, we used *integrated* step selection analysis to model habitat selection and movement preferences of dispersers simultaneously. In contrast to regular step selection analysis, this substantially reduces biases in estimated preferences and furthermore allows to parametrize a proper mechanistic movement model. Finally, to overcome some of the issues with least-cost path mapping, we contrasted least-cost paths with least-cost corridors. Although most of these considerations likely have a modest impact on our conclusions, we feel like they paid off in terms of higher confidence in our results.

According to our predictions, landscape permeability substantially differs across different regions of the KAZA-TFCA. Importantly, many regions depicted low landscape permeability mainly due to human influences, highlighting that anthropogenic pressure remains a severe impediment to dispersal. Our results also show that the KAZA-TFCA indeed covers all major dispersal routes of the African wild dog, highlighting the potential value of such an initiative. Finally, we pinpointed a potential dispersal hub in northern Botswana through which dispersers gain access to more remote regions of our study area.

While our study offers insights into the conservation needs of the highly endangered African wild dog in southern Africa, it has applicability beyond this scope. We showed how pertinent dispersal data of a highly mobile species can be used to assess the adequacy of large protected areas. Our framework was intentionally designed so that it can be expanded towards including further species and regions. We therefore believe that our study presents a powerful framework to assess the adequacy of already existing or planned protected areas in the future.

We look forward to your reply and thank you for your time and consideration of the manuscript.

Sincerely,

David Hofmann, on behalf of all co-authors