



Letter to the editor

Petracca et al. (2024) under-estimates the risk of gray wolf extinction by unscientific value judgments

Dear Editor:

We provide three constructive criticisms to improve the modeling in [Petracca et al. \(2024\)](#) for Washington state's gray wolf population. They constructed an integrated population model (IPM) with sequential observation and process models represented by four submodels of survival, abundance, and reproduction for future projections with an individual-based model (IBM) composed of a habitat suitability submodel, a movement process submodel, and observations from the IPM (a minimum of two models). We refer to these collectively as 'the Model' or by specific submodel. We advise delaying any policy changes that weaken or remove protection based on this study until independent replication occurs. We predict the Washington state wolf population faces substantially greater risk than the Model suggests.

1) Parameter selection and interactions lack scientific justification

The Model's process and observation models need better parameter selection. An overparameterized process model leaves little variance for the observation model, suggesting flawlessness, while an overly simplistic model does the converse. The Model's IPM shows strong wolf population growth during 2009–2020 and the dispersal submodel suggests complete state recolonization. This unrealistic outcome stems from neglecting biological information about individual wolves. Because IBM relies solely on IPM outputs, it also predicts steady growth and statewide colonization, regardless of variance. We suggest the IBM should be parameterized by a more realistic IPM, with data from years 2009–2020 which appeared to have been disregarded by the authors, without sacrificing utility for complexity and verisimilitude, for better projections ([Plard et al., 2019](#)). Instead, "The projection model used the age and state structure of the population process model, combined with the movement process of the IBM, to estimate wolf population dynamics at future time steps." (p.7, [Petracca et al., 2024](#)). Such a model should use data on past colonization to predict future colonization, a concern anticipated by [Carroll \(2023\)](#) who suggested backcasting to gain a better projection estimate. While all models simplify reality and inevitably fail to capture all aspects of a system, some models are more useful than others.

Parameter selection for mortality, migration, and reproduction ignores past studies of wolf biology and demography.² The individual movements submodel could be improved with better spatial resolution and inclusion of movement costs associated with crossing risky features ([Carroll, 2023](#)). The Model dismisses social structure and cooperative behaviors known to shape wolf life histories, and the effects of human activities and habitat suitability on individual, pack, and population

parameters ([Smith et al., 2020](#); [Treves and Santiago-Ávila, 2023](#)). It also over-estimates the reproductive success of new pairs by 100 % by assuming any two wolves would breed in suitable habitat, regardless of their sex. Finally, the Model assumes constant lethal removal, steady immigration from regions with high wolf mortality (Idaho and British Columbia), and no significant changes in mortality, contradicting expectations ([Treves and Santiago-Ávila, 2023](#); [Santiago-Ávila and Treves, 2022](#)).

2) Undisclosed uncertainty and omitted high risk alternative scenarios

The Model uses data from the Washington Department of Fish and Wildlife (WDFW) but lacks a published description for independent replication. Uncertainties in observations of pack size, migration, pup production, pack establishment and persistence were not incorporated. This is particularly problematic for non-collared wolves such as immigrants, the major source of wolves for Washington. How did that rate change during 2009–2020, as neighboring wolf populations in Idaho and Canada were subjected to increased wolf mortality? Additionally, the model censored data from GPS-collared wolves that disappeared, underestimating poaching and overestimating lethal management impacts ([Treves et al., 2017](#)). Censored disappearances are essential to estimating the effects of lethal management on the population ([Santiago-Ávila and Treves, 2022](#)), which Petracca et al. aimed to model.

3) Undisclosed competing interests

Despite claims of no competing or conflicts of interests, one co-author is a WDFW employee, and the authors acknowledged a WDFW-constructed committee. They also directed our data requests to the WDFW, contradicting Open Science standards requiring data to be publicly available upon publication.

Cautionary messages

We urge extreme caution when agencies rely upon a single model for reducing species or population protections. We staunchly protest the use of the Model to make "anticipatory" policy decisions and moving policy "goalposts" ([Carroll, 2023](#)), exemplified by WDFW's proposal to down-list wolves based on the Model. Such exercises should not affect protective policies and statutes that have clear precautionary guidelines for removing protections, especially if doing so will harm the policy goals. Such use also contradicts the WDFW's own policy:

"Where there is an absence of valid scientific information or incomplete scientific information ... counties and cities should use ... A 'precautionary or a no risk approach,' in which development and land use activities are strictly limited until the uncertainty is sufficiently resolved;" WDFW rule 365-195-920.

² [Institutional Repository](#).

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Similarly, we urge researchers to clearly communicate uncertainty to the public and particularly decision-makers, lest undue confidence motivate incautious policy.

CRediT authorship contribution statement

Francisco J. Santiago-Ávila: Conceptualization, Formal analysis, Writing – original draft, Writing – review & editing. **Bridgett M. vonHoldt:** Formal analysis, Writing – original draft, Writing – review & editing. **Adrian Treves:** Formal analysis, Project administration, Writing – original draft, Writing – review & editing.

Declaration of competing interest

The authors declare no financial competing interests. BMV reports her funding sources and possible competing interests here: https://vonholdt.princeton.edu/vonHoldt_CV.pdf. FJS-A presents CV including all potentially competing interests here: https://faculty.nelson.wisc.edu/treves/archive_BAS/Santiago-Avila_CV.pdf. AT reports all sources of funding since 2007 here https://faculty.nelson.wisc.edu/treves/archive_BAS/funding.pdf and his CV including all potentially competing interests here: https://faculty.nelson.wisc.edu/treves/archive_BAS/Treves_vita_latest.pdf.

Data availability

No data was used for the research described in the article.

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