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| MPI for Ornithology ∙ Eberhard-Gwinner-Straße, 82319 Seewiesen ∙ Germany |  | Research Group for  Behavioural Genetics &  Evolutionary Ecology  **Dr. Luke Eberhart-Hertel**  Haus Nr. 5  Tel.: +49 (0) 8157-932-424  Fax: +49 (0) 8157-932-214  luke.eberhart@orn.mpg.de  08.07.2021 |
| **Dr. Jon Slate**  Editor-in-Chief, *Evolution Letters* Alfred Denny Building University of Sheffield  Western Bank  Sheffield, S10 2TN United Kingdom  **Subject: Manuscript submission** |
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Dear Dr. Slate,

please find enclosed our manuscript ‘*Egg size variation in a long-lived polyandrous shorebird in the context of senescence and breeding phenology*’ to be considered for publication in *Evolution Letters*.

Life-history theory predicts that investment into reproduction compromises somatic repair, which then leads to senescence. However, other processes such as mating tactics—that are often age-dependent—may also shape within-individual variation in reproductive performance and hence appear as senescence in certain reproductive traits. There is large body of literature showing that polygynous males typically senesce faster – yet, whether this also holds true for polyandrous females is not well understood.

To disentangle female mating tactics from senescence in the wild, we used a 14-year longitudinal dataset to investigate age-dependent variation in egg size of a long-lived shorebird with a flexible mating system characterized by intense female-female competition for mates. Surprisingly, we found no sign of senescence in egg volume, despite the high maternal investment of this precocial species. Rather, we found strong seasonal variation in egg volume both within- and between-females which we interpret as a trade-off between current maternal investment and future breeding opportunities: early breeders had a higher likelihood of being polyandrous or replacing failed clutches, yet these individuals laid smaller eggs likely due to a mismatch with local peak resource availability. Curiously, body size was not related to lay date, however individuals advanced their lay date with age, indicating that prior experience gives a competitive edge in the female-female contest competition for mates, not physical prowess. Importantly, these empirical results shed new light on previous theories of egg size variation and sexual selection in polyandrous birds (e.g., Andersson, 2004, *Evolution* 58: 24–34), and thus we believe our work will stimulate innovative avenues of research in the cross-roads of individual variation, sexual selection, and senescence.

Please note that our current submission is a revision of a prior manuscript that was accepted by *Evolution Letters* but withdrawn before publication per our request (i.e., refer to EVL3-20-0082). In short, after acceptance of the prior submission, it was brought to our attention by a peer that our R code had several minor issues. After correcting these issues, our original interpretation of the results no longer held and we withdrew to re-evaluate the entire study. Although this was initially a disconcerting experience, in retrospect we are very pleased with how this saga developed and we are proud that we had taken the necessary steps to make our entire analytical workflow and pre-print open access during peer-review so that the issues could be caught before publication.

To enhance transparency and reproducibility during the review process and beyond, we have made the entire workflow of our analysis publicly available as an RMarkdown vignette on this project’s OSF repository[[1]](#footnote-1). Our study also makes use of our recently released open-access database *CeutaOPEN* – a longitudinal dataset documenting all the raw field data we have collected from an important shorebird breeding site in Mexico since 2006[[2]](#footnote-2). We hope this publication will stimulate open science in the evolutionary ecology community.

Our manuscript is not under consideration elsewhere, and all persons entitled to authorship are included and have contributed substantially to its current from. Please do not hesitate to contact us if you require any further information.

Sincerely,

Text

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Dr. Luke Eberhart-Hertel

1. Eberhart-Hertel, L. J. (2021). *Open Science Framework*.[doi.org/10.17605/osf.io/ucw6j](https://osf.io/ucw6j/) [↑](#footnote-ref-1)
2. Eberhart-Phillips, L. J. *et al.* (2020). *Scientific Data* 7:149. [doi.org/10.1038/s41597-020-0490-y](https://doi.org/10.1038/s41597-020-0490-y) [↑](#footnote-ref-2)