MAX PLANCK INSTITUTE
FOR BIOLOGY TÜBINGEN

Director: Ralf J. Sommer
Max-Planck-Ring 9, D-72076 Tübingen, Germany
Tel: ++49 7071 601371; Fax: ++49 7071 601498
E-mail: ralf.sommer@tuebingen.mpg.de

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Dr. Feilim Mac Gabhann & Prof. Jason Papin
Editors-in-Chief
PLOS Computational Biology

Dear Editors,

We would like to submit to *PLOS Computational Biology*, our manuscript entitled "Spatial and temporal heterogeneity alters the cost of plasticity in *Pristionchus pacificus*".

The prevalence of developmental (phenotypic) plasticity in nature has been thoroughly documented[1]. However, many unanswered questions remain with respect to ecological and evolutionary consequences of phenotypic plasticity. A major contention in this regards has been the concept of the cost of plasticity, i.e., the intrinsic fitness cost of a developmentally-plastic system in contrast to a non-plastic alternative [2]. In a previous contribution, we utilized an integrative approach, combining experimental and theoretical tools, to demonstrate a clear case of the cost of plasticity in the hermaphroditic nematode *Pristionchus pacificus*[3].

P. pacificus forms teeth-like denticles that result in two alternative mouth morph phenotypes, i.e. cannibalistic or non-predatory morphs. Over the last decade, my lab has shown that this dimorphism is experimentally tractable[4] and we identified the gene regulatory network of plasticity through a series of forward and reverse genetic screens[5]. In addition, the cannibalistic behavior has proven to be genotype-specific with an associated self-recognition system[6].

In this manuscript, we present a stage-structured metapopulation model based on the experimentally-derived data from *P. pacificus*. To fully understand the ecological consequences of the cost of plasticity in *P. pacificus*, we introduce both spatial and temporal heterogeneity with respect to the resource type. We

[1] West-Eberhard, 2003

[2] DeWit et al., Trends Ecol. Evol., 1998; Forsman, Heredity, 2015; Murren et al., Heredity, 2015

[3] Dardiry et al., Evol. Lett., Volume 7, Issue 1, 2023, Pages 48–57

[4] Bento et al., Nature, 2010

[5] Ragsdale et al., Cell, 2013; Sieriebriennikov et al., Cell Rep., 2018

[6] Lightfoot et al., Science 2019

highlight how such heterogeneity can alleviate the cost of phenotype and result in transient coexistence and even competitive exclusion of the non-plastic genotype. Our work adds a novel case study to the growing literature on the role of phenotypic plasticity in shaping ecological communities and its importance in fluctuating environment.

We submit a format-neutral version of our manuscript that contains all the relevant documents. There is no competing interest for any of the authors. The the codes used for data analysis and simulations are available at `https://github.com/Kalirad/MetaPopProjection`.

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As potential reviewers we would recommend any of the following:

Ehab Abouheif[*†] McGill University (ehab.abouheif@mcgill.ca)

Charlotte T. Lee[†‡] Duke University (charlotte.t.lee@duke.edu)

Hannah Schneider[*†] Wageningen University (hannah.schneider@wur.nl)

Roberto Salguero-Gómez[*†‡] University of Oxford (rob.salguero@zoo.ox.ac.uk)

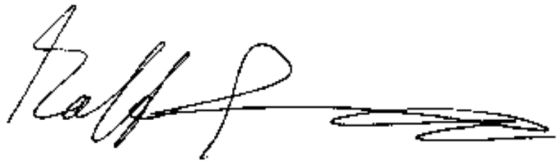
Andrea Scharf[‡♣] Missouri University of S & T (scharfa@mst.edu)

Simon Hart[*†‡] The University of Queensland (s.hart@uq.edu.au)

Areas of expertise: *Phenotypic plasticity. †Ecology. ‡Computational biology. ♣Nematology.

We look forward to hearing from you.

Sincerely,



Ralf J. Sommer, PhD
Director, MPI for Biology Tübingen
Adjunct Professor,
University of Tübingen