

University of Groningen

Evolutionary ecology of the variable breeding system of Chinese penduline tits

Zheng, Jia

DOI:
[10.33612/diss.249069345](https://doi.org/10.33612/diss.249069345)

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version
Publisher's PDF, also known as Version of record

Publication date:
2022

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):
Zheng, J. (2022). *Evolutionary ecology of the variable breeding system of Chinese penduline tits*. [Thesis fully internal (DIV), University of Groningen]. University of Groningen.
<https://doi.org/10.33612/diss.249069345>

Copyright

Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

The publication may also be distributed here under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license. More information can be found on the University of Groningen website: <https://www.rug.nl/library/open-access/self-archiving-pure/taverne-amendment>.

Take-down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Downloaded from the University of Groningen/UMCG research database (Pure): <http://www.rug.nl/research/portal>. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.

**Evolutionary ecology of the variable
breeding system of Chinese
penduline tits**

郑佳
Jia Zheng

The research presented in this thesis was carried out at the Behavioural and Physiological Ecology group (BPE) and the Theoretical Research in Evolutionary Life Sciences group (TRÊS) from the Groningen Institute for Evolutionary Life Sciences (GELIFES) of the University of Groningen (The Netherlands), and the Ministry of Education Key Laboratory for Biodiversity Sciences and Ecological Engineering, College of Life Sciences, Beijing Normal University (China). Fieldwork was carried out at Liaohekou national reserve (China) and Xianghai national reserve (China).

Jia Zheng received a PhD-grant from China Scholarship Council (CSC grant NO. 201907720018). Part of the work in this thesis was funded by the RC Lewontin Early Award from the Society for the Study of Evolution (SSE), China Birdnet, National Natural Science Foundation of China (31970405, 31572288, 31672316), The Netherlands Organization for Scientific Research (NWO) (NWO-TOP grant-854.11.003 and NWO-ALW; 823.01.014), and European Research Council (ERC Advanced Grant No. 789240) under the European Union's Horizon 2020 research and innovation programme. The printing of this thesis was funded by the University Library and the Graduate School of Science and Engineering of the University of Groningen.

Cover design and sketch: 彭锦梅 (Jinmei Peng)

Figures: scientific figures by 郑佳 (Jia Zheng), schematic illustrations in Chapter 4 by 郭钰琦 (Yuqi guo), Photography of penduline tits by 姜金山 (Jinshan Jiang)

Layout and printing: ProefschriftMaken || www.proefschriftmaken.nl

Thesis submitted date: 15-July-2022

Thesis approved date: 29-Aug-2022

PhD defence date: 21-Nov-2022

Copyright © 2022, Jia Zheng

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without prior permission of the author or the copyright-owning journals for previous published chapters.



university of
 groningen

Evolutionary ecology of the variable breeding system of Chinese penduline tits

PhD thesis

to obtain the degree of PhD at the
 University of Groningen
 on the authority of the
 Rector Magnificus Prof. C. Wijmenga
 and in accordance with
 the decision by the College of Deans.

This thesis will be defended in public on

Monday 21 November 2022 at 14.30 hours

by

Jia Zheng

born on 16 July 1992
 in Shenyang, China

Supervisors

Prof. J. Komdeur

Prof. F. J. Weissing

Prof. Z. Zhang

Assessment Committee

Prof. B. Hatchwell

Prof. C. Both

Prof. A. Pilastro

Thesis outline

Chapter 1. General introduction	7
Chapter 2. Breeding biology and parental care strategy of the little-known Chinese penduline tit (<i>Remiz consobrinus</i>)	27
Chapter 3. Males and females of a polygamous songbird respond differently to mating opportunities	43
Chapter 4. A novel function of egg burial: burying material prevents eggs rolling out of wind-swayed nests	69
Chapter 5. Differences in parental care system between two Chinese penduline tit populations and the potential causes	95
Chapter 6. Parental removal experiments in a polygamous songbird: Are parents in biparental care nests less capable of caring than those in uniparental care nests?	117
Chapter 7. Effects of season length and uniparental care efficiency on the evolution of parental care	133
Chapter 8. General discussion	153
References	167
Summary - Samenvatting	185
Acknowledgments	193
About the author	198
Author Affiliations	199

