

# Egg burial protects eggs from rolling out of the wind-swayed nest in Chinese penduline tits

Jia Zheng<sup>a,b</sup>, Emiel Zuidema<sup>a</sup>, Zhengwang Zhang<sup>b</sup>, Tamás Székely<sup>c</sup>, Mei Guo<sup>b</sup>, Jan Komdeur<sup>a,\*</sup>

<sup>a</sup> Behavioral and Physiological Ecology, Groningen Institute for Evolutionary Life Sciences, University of Groningen, The Netherlands  
<sup>b</sup> Ministry of Education Key Laboratory for Biodiversity Sciences and Ecological Engineering, College of Life Sciences, Beijing Normal University, China  
<sup>c</sup> Milner Centre for Evolution, Department of Biology and Biochemistry, University of Bath, UK



✉ jia.zheng@rug.nl

## Background

**Egg burial:** Parents bury eggs with material during the egg-laying stage. To protect the clutch when they are temporarily absent

The basic revealed function of egg burial:

- predation
- extreme weather protection
- temperature regulation
- anti-brood parasitism
- against nest usurption
- resolution of sexual conflict

## Egg burial in penduline tits

Female Eurasian penduline tits (*Remiz pendulinus*) bury eggs to hide the presence of eggs so that they create the chance of deserting clutch earlier than male partner to find new partner.

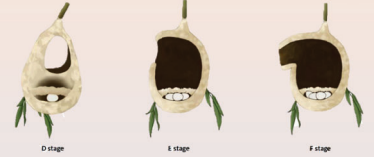
However, in Chinese penduline tits (*Remiz consobrinus*), males may know of the eggs.



Eurasian penduline tits



Chinese penduline tits



Egg burial and nest stages in penduline tits

## Question 1. Did sexual conflict drive egg burial in Chinese penduline tits?

### Methods

- Unfold burying material
- Film the nest for 1.5h
- Check if eggs were buried again after filming
- Night checking

### Results

- (1) Male and female bury eggs at the same frequency
  - (2) 93.5% of the nests both breeders roosting in the nests
- Confirmed that the male parent knows of the egg presence!

**Sexual conflict is *NOT* the driver**

## Question 2. What is the alternative function(s) of egg burial in Chinese penduline tits?

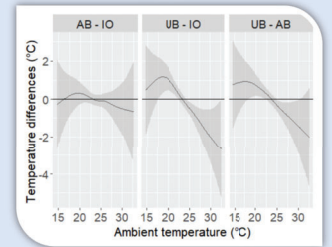
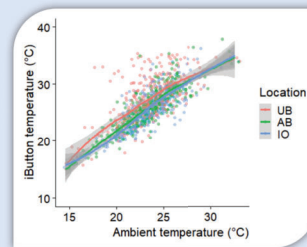
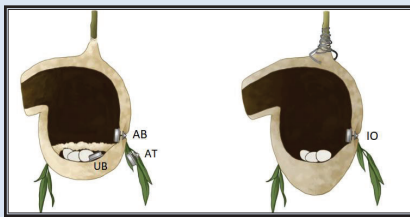
### Hypothesis 1. Anti-brood parasitism

- Added an egg on the top of burying layer
- Checked if the eggs got accepted or rejected

- All eggs accepted, no nest being abandoned (n = 15 nests)
- Rejected ✗**

### Hypothesis 2. Temperature regulation

- Recorded temperature with iButton at 4 locations
- Compared temperature and hatching success

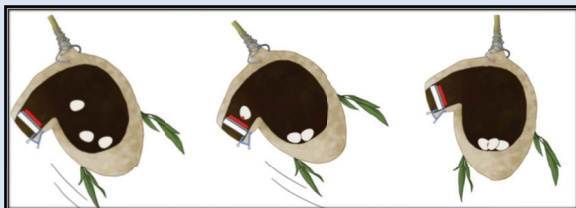


- Temperature is different between covered eggs and buried eggs
- Hatching success is not different (p = 0.77, n = 17 nests)

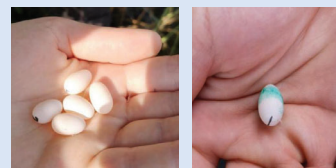
**Rejected ✗**

### Hypothesis 3: Egg protection against wind

- Blocked experimental nest entrance with stamper
- Checked nr. of marked eggs for unburied eggs
- Checked nr. of eggs being thrown out of breeding nest

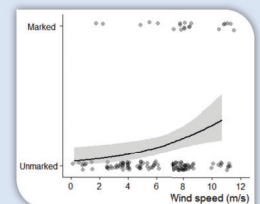


- 45.2% of experimental nests have marked eggs (egg uncovered)
- **No** eggs lost from breeding nests (egg covered)
- **No** eggs crushed in any nests (n = 31 nests)
- The probability of egg being marked increased with wind speed



Unmarked eggs

Marked egg



**Supported ✓**

## Take home message

- Egg burial prevents eggs from rolling out of the wind-swayed nest in Chinese penduline tits ★
- Cannot completely reject temperature regulation. Need studies across populations, combining historical climate conditions or lab experiments
- Egg burial fulfills different functions in two sister species ★