



Contrasting egg recognition between European and Asian populations of tree sparrows (*Passer montanus*)



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ABSTRACT

Although many biological phenotypes are generally regarded as consistent across the distributional range of a species, some traits such as egg discrimination behavior have been shown to display extensive intraspecific variation as a response to selection from brood parasitism. We investigated the egg recognition ability in an Asian population of tree sparrows (*Passer montanus*), and we compared that with the ability to recognize and reject intraspecific foreign eggs in a population in Europe. Extensive artificial parasitism with model eggs and real eggs of eight sympatric birds that vary in background color and markings revealed that egg recognition capacity is completely absent in this Asian population of tree sparrows. This result contrasts with previous studies in European populations showing extensive ability for discriminating between own and foreign eggs. Different evolutionary equilibria or differences in the risk of conspecific parasitism may account for differences in egg discrimination ability between European and Asian populations of tree sparrows.

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1. Introduction

Intraspecific variation in behavior is widespread, although equally many species show highly consistent behavior across the distributional range of a species (Lott 1991). For example, several species of cuckoo hosts show extensive differences in anti-parasite behavior due to differences in risk of parasitism or differences in gene flow (Møller and Soler, 2013). For example, egg discrimination behavior in passerines may fluctuate considerably among populations within a species in response to differences in selection due to conspecific or interspecific brood parasitism (Liang et al., 2013; Yang et al., 2015a,b).

While many studies have considered intraspecific variation in behavior to be a nuisance (review in Lott 1991), such variation is an important research tool because it helps pinpoint variation in factors accounting for differences in underlying selection. Such spatial variation may partly be attributed to abiotic variables that affect the phenotype of the parasite and the host, but also the degree of mimicry (Møller and Soler, 2013). Furthermore, specific life history characteristics of hosts that vary spatially and/or temporally may affect the probability of initial colonization of a new host species

and the direction and the rate of coevolution (Thompson, 2005; Møller and Soler, 2013).

The tree sparrow (*Passer montanus*) is one of the most widespread Old World passerines that is familiar to humans because it generally lives in residential areas of human settlements (Summers-Smith, 1995). In Europe, tree sparrows were parasitized by conspecifics, and were capable of discriminating between own and conspecific foreign eggs (Yom-Tov, 1980). To investigate possible phenotypic variation in egg discrimination behavior among distant geographic populations in tree sparrows, we conducted extensive artificial parasitism experiments in an Asian population of tree sparrows by using non-mimetic model and real eggs with a variety of colors or patterns for testing its egg recognition abilities. We compared the egg discrimination behavior of this Asian population with the results in European populations and discussed the possible explanations for heterogeneity in response to alien eggs between continents.

2. Materials and methods

2.1. Study areas

Artificial parasitism experiments were conducted in Zhalong National Nature Reserve (ZL, 46°48′–47°31′N, 123°51′–124°37′E) during the breeding season from May to August 2013. The study site

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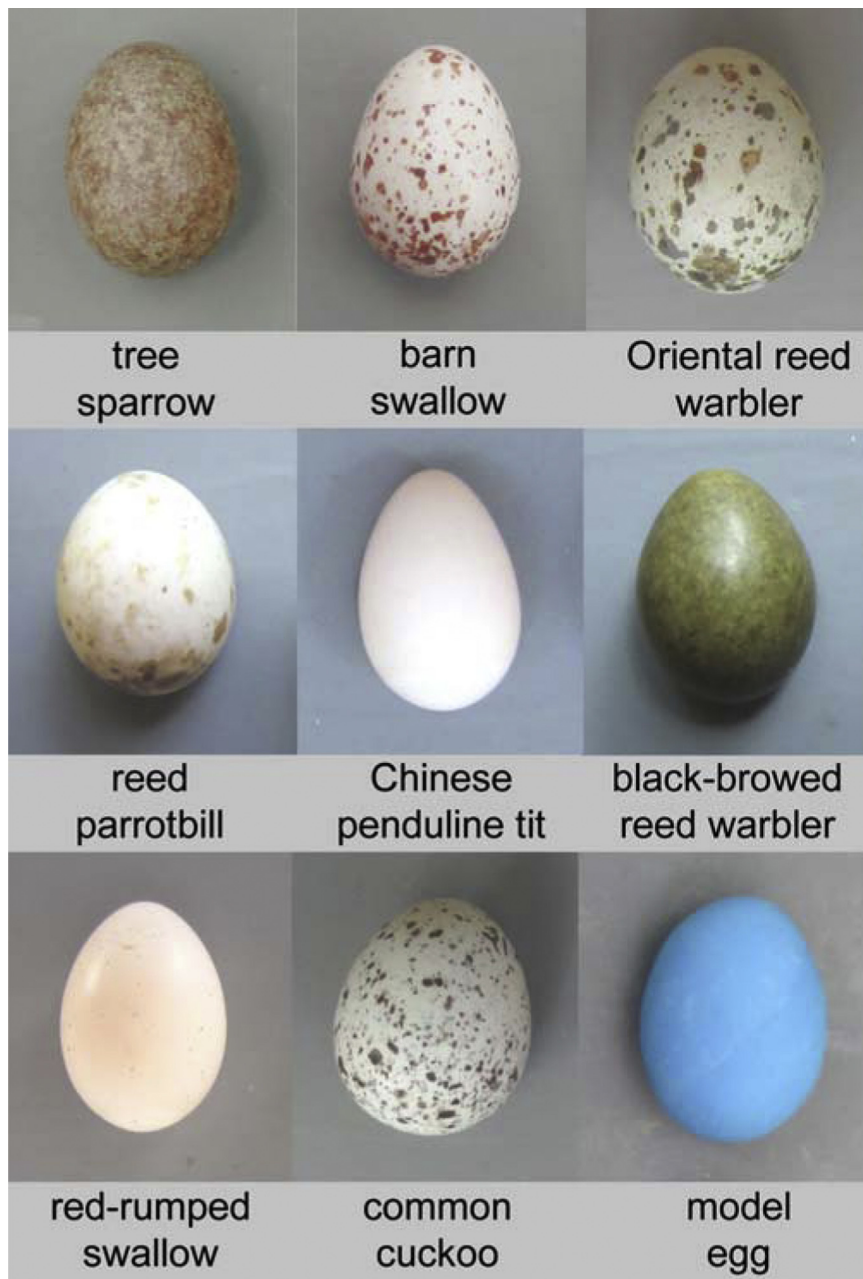


Fig. 1. Model eggs and real eggs used for parasitism experiments in tree sparrows (see Table 1 for scientific names of species). Common cuckoo (*Cuculus canorus*) eggs were collected from nests of Oriental reed warblers (*Acrocephalus orientalis*).

lies in the north of the Songnen Plain in Heilongjiang, North-eastern China. This area includes reed swamps, open water and degraded grasslands. The mean annual temperature and precipitation are 3.2 °C and 426 mm, respectively (Yang et al., 2014).

2.2. Study species

Old World sparrows are among the most familiar of all bird species (Allende et al., 2001). Tree sparrows have a worldwide distribution with a natural breeding range from temperate zones in Europe and Asia, through Southeast Asia to tropical areas in Java and Bali. They are widespread in towns and agricultural areas (Summers-Smith, 1995). Tree sparrows mainly use dry grasses for nest building, and the nest structures depend on the nest sites chosen. For example, small holes in buildings contain less nest material than nestboxes because cavities are filled with dry grasses inde-

pendent of their size. Therefore, in some cases when tree sparrows build nests in trees like house sparrows (*Passer domesticus*) in China (Yang et al., 2015a; Hu et al., 2015), their nests can be large with plenty of dry grasses and large entrances (LW and WL, personal observations in Taiwan), whilst in small holes in buildings they use much less material and the entrances are very small. In the present study all tree sparrow nests were in nestboxes or buildings.

2.3. Artificial parasitism experiments

Parasitism experiments during the egg stage were conducted in sparrow nests on the day after clutch completion. We artificially parasitized the nests of the tree sparrow with model eggs made from polymer clays and real eggs from a variety of species, including 6 species of passerines and one species of parasitic cuckoo (for more details, see Table 1). Conspecific eggs from different clutches

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