

Original Article

Divergence in timing of parental care and migration in barnacle geese

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In migratory geese, the extended association of parents and offspring is thought to play a crucial role in culturally transmitting the migration strategy to the next generation. Goslings migrate with their parents and associate closely with them almost until the next breeding season. Families do not break up until spring migration, when the parent–offspring contact intensifies during preparation for the next generation of offspring. Recently, the commencement of spring migration of the Russian population of the barnacle goose has been delayed by about 1 month. Here, we investigated whether the duration of parental care behavior changed with this alteration in migratory behavior. In contrast to our expectation, we found that parental care terminated well before the commencement of spring migration and that parent–offspring associations were nearly absent during spring migration. We argue that the mechanisms for determining the duration of parental care is different from that determining the commencement of spring migration; hence, we conclude that a divergence in timing has developed between both behaviors. A consequence of this divergence could be that the cultural transmission of migratory behavior is disrupted, possibly playing a role in the recent establishment of new populations of Barnacle geese across the Russian way.

known to be influenced by the earth's magnetic field, photoperiod, and/or polarized light (Alerstam et al. 2003), and the sensitivity for these cues is suggested to be genetically programmed. For example, studies on blackcaps *Sylvia atricapilla* showed that both the migratory restlessness (Berthold and Querner 1981) and the migratory direction (Helbig 1991) have a genetic basis.

In contrast, there are some species in which all migratory

The population of barnacle geese breeding in Russia migrates in spring from wintering grounds in The Netherlands

and period as predictor variable. Additionally, we did a post hoc analysis with a Bonferroni correction, using a binomial

ysis showed that the length of foraging and vigilance bouts was significantly different between period and parental status: estimate: 0.15, $F_{3,934} = 56.77$, $P < 0.0001$; parental status: estimate: 0.11, SE of estimate: 0.0001; vigilance: R^2 adjusted: 0.08, $P < 0.0001$; interaction period–parental status: estimate 0.04; $F_{2,226} = 2.6$, $P = 0.01$). The length was significantly longer for parents than for nonparents with only 5.2 s in October. Foraging bouts were different, with 12.3 and 24.4 s in October and November, respectively. During November, foraging (12.8 vs. 21.9) bouts were different as well as from December until February (12.2 and foraging: 16.9 vs. 26.8). From March until May, the length of both vigilance (March: 5.3 vs. 10.9 and May: 10.9 vs. 5.6) and foraging (March: 16.7 vs. 19.7, and May: 43.9 vs. 16.7) bouts was significantly different (Table 4 for statistical details). Note that in October, the percentage of time spent on foraging or on vigilance was the same for both foraging and vigilance bouts

data to support the long parental care or family duration of

potential disruption of transmission of migration strategy, as a result from a divergence between the commencement of spring migration and the end of parental care, can explain the emergence of new migration strategies in barnacle geese.

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