

Provided for non-commercial research and education use.
Not for reproduction, distribution or commercial use.



(This is a sample cover image for this issue. The actual cover is not yet available at this time.)

This article appeared in a journal published by Elsevier. The attached copy is furnished to the author for internal non-commercial research and education use, including for instruction at the authors institution and sharing with colleagues.

Other uses, including reproduction and distribution, or selling or licensing copies, or posting to personal, institutional or third party websites are prohibited.

In most cases authors are permitted to post their version of the article (e.g. in Word or Tex form) to their personal website or institutional repository. Authors requiring further information regarding Elsevier's archiving and manuscript policies are encouraged to visit:

<http://www.elsevier.com/copyright>



Contents lists available at SciVerse ScienceDirect

Transportation Research Part D

journal homepage: www.elsevier.com/locate/trd

Notes and comments

The effects on birds of human encroachment on the Qinghai–Tibet Plateau

Chen Ge, Zhongqiu Li*, Jing Li, Cheng Huang

The State Key Laboratory of Pharmaceutical Biotechnology, School of Life Science, Nanjing University, 22 Hankou Road, Nanjing 210093, China

ARTICLE INFO

Keywords:

Alert distance
Flight initiation distance
Qinghai–Tibet Railway
Human encroachment on habit

ABSTRACT

We used alert distance and flight initiation distance to evaluate the effects of the Qinghai–Tibet Railway and Highway on snowfinches' responses to human encroachment. Road effect was divided into those associated with villages as high disturbance, area between Qinghai–Tibet Railway and Qinghai–Tibet Highway as medium and other areas away from roads as low. The result showed that the alert distance and flight initiation distance of snowfinches decreased significantly with increasing road effects, which indicated the Qinghai–Tibet Railway and Highway significantly affected the bird's vigilance behavior.

© 2011 Elsevier Ltd. All rights reserved.

1. Introduction

Transport infrastructure including roads and railways affect human habitation patterns and can cause considerable pressure on local wildlife and their habitat. The Qinghai–Tibet Railway, for example, which was completed in 2006, brought large number of people onto the Qinghai–Tibet Plateau. While promoting prosperity in the region, it also disturbed local animals (Xia et al., 2007). Much of the work done on wild life effects of transportation investments has focused on large mammals like Tibetan Antelope (Lian et al., 2011). In contrast we focus on snowfinches, which are widely distributed on the Plateau and are also an important part of the alpine meadow ecosystem.

Specifically, we examine the response of three endemic snowfinch species on the Plateau to human approach with respect to different road effects along the Qinghai–Tibet Highway and Railway, and to see whether the birds become more tolerant or sensitive to human disturbance.

2. Methods

The study was conducted from Budongquan to Wenquan along the Qinghai–Tibet Railway and Qinghai–Tibet Highway in July 2009 and 2010. The Qinghai–Tibet Plateau is the highest in the world, with a mean altitude of 4600 m above sea level. The local climate is characterized by dry, cold, and long winters, strong winds, and high levels of solar radiation. The mean annual temperature is -8°C with an extreme recorded low of -46°C . The main vegetation type in the area is alpine grassland and meadow, entirely devoid of trees and shrubs. This region is sparsely populated and is locally referred to as 'no man's land'.

Three endemic snowfinch species studied: the white-rumped snowfinch (*Montifringilla taczanowskii*), plain-backed snowfinch (*Montifringilla blanfordi*) and rufous-necked snowfinch (*Montifringilla ruficollis*). We used alert distance (the distance between the disturbance source and the animal at the point where the animal changes its behavior in response to the human approach – specifically, in birds, when raised and oriented head to the approaching human, hereafter AD) and flight initiation distance (at which distance the animal begin to flush when human approach to it, hereafter FID) as indicators of the snowfinches' tolerance to human disturbance.

* Corresponding author.

E-mail address: lizq0314@gmail.com (Z. Li).

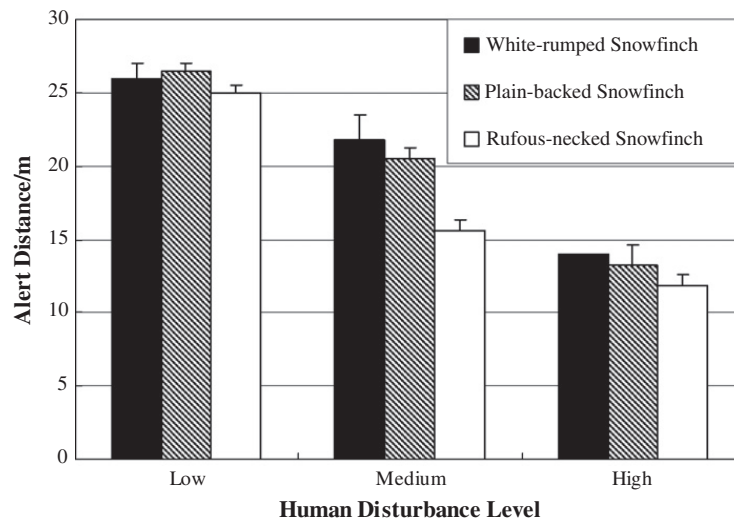


Fig. 1. Alert distances. Note: The average alert distance differed significantly with human disturbance (two-factors ANOVA, $F_{2,281} = 130.307$, $P < 0.001$).

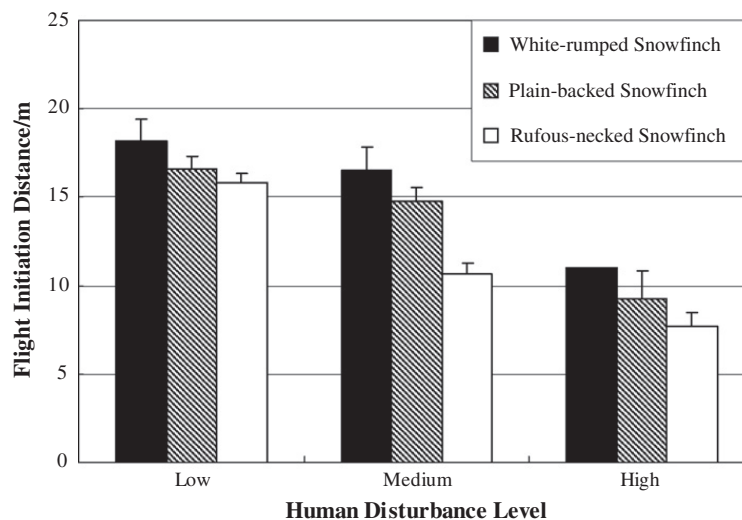


Fig. 2. Flight initiation distances. Note: The average flight initiation distance differed significantly with human disturbance (two-factors ANOVA, $F_{2,281} = 44.769$, $P < 0.001$).

We divided the study sites into; villages with high traffic flow and human disturbance; areas between the Qinghai–Tibet Railway and Qinghai–Tibet Highway with medium traffic flow and human disturbance; and wild field away from the other two with low road effect. To examine the consequences of the encroachment of human, we measured the AD and FID of the snowfinch's species with a laser range finder, and took down the group status and the local human disturbance level. Only one person, wearing the same coat in each case, slowly moved toward the birds at a given speed. To avoid resampling, data were collected only once one site per day.

The data of AD and FID were in accord with the normal distribution one sample Kolmogorov–Smirnov test. We used a general line model, two-factors analysis of variance to analyze how the finches' AD and FID vary with road effect and species.¹ We used LSD for the *post hoc* test if the differences were significant, using a 5% confidence level cut-off.

3. Results

Some 286 samples were collected, including 33 white-rumped snowfinches, 114 plain-backed snowfinches and 139 rufous-necked snowfinches. 172 of the birds were found in areas of low road effect, 67 medium and 47 high. The AD and FID of the finches differed significantly by type among levels of road effect. The AD and FID found in low human disturbance areas were significantly longer than that in medium human disturbance areas, while AD and FID in medium human disturbance areas were significantly longer than those in villages with high human disturbance (Figs. 1 and 2).

¹ Interaction between road effect and species is non-significant at the 5% confidence level, so we remove it from the analysis.

The interspecific difference of AD and FID among the snowfinches was significant. The AD and FID of the white-rumped snowfinches were significantly longer than that of the other two species, and the AD and FID of plain-backed snowfinches were significantly longer than that of rufous-necked snowfinches.

4. Discussion

The AD and FID of the various species of snowfinches decreased with increasing road effect level probably because of the change in habitat brought by human disturbance and the birds' habituation to human appearance. The habitat changes include changes in the food availability and in predation risk. Human activity along the traffic line brings plenty of refuses that the finches can integrate into their food supply. Where food is more abundant, it becomes worthy of taking risks to have shorter AD and FID. Besides, predation risk is lower in more disturbed area.

The habituation to human appearance was beneficial to the birds. Tolerance in area along the traffic line establishes buffers that avoid unnecessary waste of energy and time in vigilance and in escape, especially when human activities at these sites does not involve hunting for these small bird species.

We also found significant interspecific differences in AD and FID that might be caused by their particular behavioral habits or other factors, e.g., the body size. White-rumped snowfinches, the largest among the three species, is the least tolerant to human approach.

Acknowledgements

We thank the Key Projects in the National Science & Technology Pillar Program during the 11th 5-Year Plan Period (2007BAC03A08) and Nanjing University Funds for starting research for financial supports. We thank Guy Beauchamp for comments on the paper, and Aichun Xu, Yankuo Li, Jie Zhu, Yingbo Zhang, jiansheng Dong, Qin Ying, Nima, Mengke, Jianming Lin, and Xiaojun Wu for help in the field work.

References

- Lian, X.M., Zhang, T.Z., Cao, Y.C., Su, J.P., Thirgood, S., 2011. Road proximity and traffic flow perceived as potential predation risks: evidence from the Tibetan antelope in the Kekexili National Nature Reserve, China. *Wildlife Research* 38, 141–146.
- Xia, L., Yang, Q.S., Li, Z.C., Wu, Y.H., Feng, Z.J., 2007. The effect of the Qinghai–Tibet Railway on the migration of Tibetan antelope *Pantholops hodgsonii* in Hohxil National Nature Reserve, China. *Oryx* 41, 352–357.