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Black is the new orange: flight initiation distance of a tropical forest bird in relation to human clothing colour

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ABSTRACT

Avitourism has multiple conservation and economic benefits but can pose potential harm to some bird populations. To mitigate the potential impacts of avitourism on birds, researchers can use flight initiation distance (FID) to quantify the tolerance of animals to perceived threats, thereby informing management. This study focused on whether clothing colour used by avitourists (orange, camouflage, and black) affected the FIDs of White-rumped Shama *Copsychus malabaricus* ($n=123$) in a protected area in northeastern Thailand. Camouflage clothing evoked significantly shorter FIDs than orange and black clothing, which elicited statistically similar FIDs. The results of this study aligned with the colour concealment hypothesis, which suggests that clothing colour resembling the forest environment reduces detectability, which results in shorter FIDs. As such, clothing colour may mediate disturbance caused by avitourists. Given that at least one species of Southeast Asian tropical forest bird adjusts its FID in relation to clothing colour, FID studies on additional Asian tropical bird species and clothing colours are encouraged.

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Avitourism; *Copsychus malabaricus*; Dry evergreen forest; Thailand; White-rumped Shama

Introduction

Ecotourism is defined as responsible, low-impact travel to natural areas that conserves the environment and sustains the well-being of local people. Ecotourism represents a substantial and growing travel sector, demonstrating its capacity to contribute to economic development, environmental preservation, and the safeguarding of cultural heritage to the benefit of both local inhabitants and international tourists (Callaghan et al., 2018; Pornprasit & Rurkkhum, 2019). Avitourism is a segment of ecotourism in which the tourist mainly participates in activities centred around watching, photographing and/or filming birds (Steven et al., 2018). In terms of economic benefits, avitourism is among the fastest growing specialisation of ecotourism; a single vagrant bird (like the Black-backed Oriole *Icterus abeillei* in Pennsylvania) stimulated travel activity worth

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an estimated \$223,000 USD (Callaghan et al., 2018). According to Biggs et al. (2011), if there is sustained long-term support, avitourism initiatives have the potential to offer a cost-efficient means of creating employment opportunities while delivering advantages for both conservation efforts and human development.

In contrast, avitourism activities can alter the behaviour of birds and has the potential to inflict harm upon them. Avitourists may be enticed to get too close to birds or use playback/pishing (vocal imitation of avian calls), which can lead to anthropogenic disturbance (Steven et al., 2011; 2021). Such anthropogenic disturbance can harm birds by, for example, reducing self-maintenance behaviours, causing increased nest abandonment and/or reduced utilisation of higher quality feeding sites (Johnson & Maness, 2018; Sekercioglu, 2002; Wei et al., 2005; Weston et al., 2012; Zhang et al., 2017). Consequently, there has been growing interest in developing strategies to mitigate some of the potential impacts of avitourism on birds, including the development of guidelines to reduce anthropogenic disturbance caused by avitourists. Such guidelines often address aspects of birdwatcher behaviour or appearance thought to be problematic, for example several make recommendations about desirable clothing colour for avitourists (Radkovic et al., 2019; Slater et al., 2019; Weston et al., 2015; Zhou & Liang, 2020). A sensible first step to mitigate the impact of human activity on birds is to quantify the impact of such anthropogenic stimuli and the factors which mediate that impact. Flight initiation distance (FID) is often employed to quantify and evaluate the fear/escape response of birds (Weston et al., 2012). FID is the distance at which the animal initiates flight to evade an approaching perceived threat, providing insights into the bird's boldness and tolerance to anthropogenic proximity (Weston et al., 2012).

FID is influenced by a range of environmental variables. For example, thicker vegetation can potentially reduce the FIDs of birds because such vegetation either lower visibility and/or increase the availability of potential refuges, apparently reducing a bird's perception of threat in such circumstances (Camp et al., 2012; Tätte et al., 2018). Another example of environmental influences on avian FIDs is the common finding that urban birds mostly have shorter FIDs than rural birds (Cavalli et al., 2016; McGiffin et al., 2013; Møller et al., 2013). The decreased FID among urban birds is thought to be the result of either birds becoming habituated to human presence and/or the selection for human-tolerant individuals (personalities) in urban settings (Cavalli et al., 2016; McGiffin et al., 2013; Samia et al., 2017; Sprau & Dingemanse, 2017; Vincze et al., 2016). Apart from environmental variables, the characteristics of the birds can also influence FIDs. Previous research has shown that different species, sexes, body sizes and stages of life history (breeding versus non-breeding) can alter the FID of birds (Burger, 1981; Burger et al., 2010; Gill, 2007; Goss-Custard & Verboven, 1993; Lafferty, 2001; Rodgers & Smith, 1995; Tarlow & Blumstein, 2007; Weimerskirch et al., 2002).

One mediating factor that has received increasing attention is clothing colour (Gould et al., 2004; Gutzwiller & Marcum, 1993; Jiang et al., 2023; Zhou & Liang, 2020). This might be attributed to the fact that selecting specific clothing is an aspect of human appearance that can be simply modified, and may mediate disturbance to birds. Simply wearing clothing (long sleeved shirt with long pants) of dull colour (i.e. black or khaki) could help observers blend in with their surroundings, reducing visibility