



A Kenyan endemic bird species *Turdoides hindei* at home in invasive thickets

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Abstract

Thickets along rivers in Eastern Kenya are important habitats for many endangered species. These habitats also provide fundamental ecosystem services for humans. Intense anthropogenic activities during the past decades have caused a severe reduction of this vegetation and resulted in fragmentation of the remaining thicket patches. We assessed the occurrence of the Kenyan endemic bird species Hinde's Babbler (*Turdoides hindei*) in a highly fragmented environment and performed detailed land use mapping along the Nzeu River in East Kenya. We measured the time the birds spent in thicket patches, which differed in their habitat setting: pristine versus surrogate vegetation, different habitat size and different edge-size-ratio. Further, we identified areas of potential conflicts between human activities and our target species. Four *T. hindei* family groups were observed, mostly in invasive *Lantana camara* patches. Habitat size and edge-size-ratio of the respective thicket patches revealed a significant impact on the duration of stay of *T. hindei* with disproportional longer stays in small habitat patches and in patches with larger edge-size-ratio than in rather large patches or thickets with small edge-size-ratio. The 75%- and 95%-kernels showed no overlap between family groups and only marginal overlap with the 75%-kernels of human disturbances. Our data show that the invasive *L. camara* thickets (even small patches with high edge-size ratio) are a suitable surrogate habitat for the Kenyan endemic for *T. hindei*. The birds avoid open land likely because of higher predation pressure outside of thickets. Limited overlap between zones of human activity and the occurrence of *T. hindei* may be a response either to lacking thickets in these areas, and/or an adaptation to elevated hunting pressure in these zones. Therefore, the transformation of thickets into open agricultural land has a negative impact on the persistence of *T. hindei*. For the preservation of the remaining *T. hindei* family groups in our study area we suggest to establish an interconnected network of thicket patches, as the high mobility of the species allows persistence in such patchy environments.

Zusammenfassung

Gebüschstrukturen entlang von Flussläufen in Ostkenia bilden wichtige Lebensräume für viele gefährdete Tierarten. Diese Ökosysteme stellen außerdem wichtige Ökosystemdienstleistungen für die Menschen bereit, die sich entlang der

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Flussläufe angesiedelt haben, bereit. Die intensive anthropogene Nutzung während der letzten Jahrzehnte führte zu einem starken Rückgang dieser Gebüschstrukturen und damit verbunden zu einer Fragmentierung der verbliebenen Vegetation. In der vorliegenden Untersuchung haben wir das Vorkommen der für Kenia endemischen Drosselart *Turdoides hindei* aufgenommen und eine detaillierte Landnutzungskartierung entlang des Nzeeu Flusses in Ostkenia, unserem Studiengebiet, durchgeführt. Dabei wurde die Verweildauer der Individuen in den Gebüschresten gemessen. Für die Gebüschreste haben wir weitere, detaillierte Charakteristika aufgenommen: ursprüngliche und invasive Vegetation, Gebüschgröße, und das Verhältnis zwischen Habitatrand und Habitatgröße. Außerdem wurden potentielle Konflikträume identifiziert, in denen sich menschliche Nutzung und das Vorkommen dieser Vogelart überlagern. Die vier beobachteten Familiengruppen hielten sich überwiegend in dichtem Gebüsch auf, das hauptsächlich aus der invasiven Pflanzenart *Lantana camara* bestand. Die Individuen hielten sich überproportional länger in kleinen Habitatresten und in Gebüschresten mit einem großen Habitatrand-Habitatgröße-Verhältnis auf. Die berechneten 75%- und 95%-Kernels zeigten keine Überlappung zwischen den vier Familiengruppen und nur eine geringe Überschneidung mit den 75%-Störungskernels menschlicher Aktivitäten. Unsere Daten zeigen dass die invasive Pflanzenart *L. camara* ein wichtiges Sekundärhabitat für *T. hindei* darstellt, selbst wenn die Gebüschreste klein sind und ein großes Habitatrand-Habitatgröße-Verhältnis aufweisen. Die Vogelart meidet offene Flächen, da hier von einem erhöhten Prädationsdruck ausgegangen werden kann. Die geringe Überlappung von Bereichen menschlicher Aktivität und dem Vorkommen von *T. hindei* könnte entweder auf das geringere Vorhandensein von Gebüschstrukturen in diesen Bereichen zurückzuführen sein, oder eine Reaktion auf die intensive Vogeljagd in diesen Gebieten sein. Die Rodung von Gebüschresten und deren Umwandlung in landwirtschaftlich genutzte Fläche wirken sich somit negativ auf die Persistenz von *T. hindei* aus. Um das Überleben der verbliebenen *T. hindei* Familiengruppen in unserem Studiengebiet sicherzustellen schlagen wir ein Netzwerk von Gebüschstrukturen vor, welche durch die hohe Mobilität dieser Vogelart ein Überleben, selbst in einer lückenhaften Umwelt ermöglicht.

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Keywords: Edge effects; Fragmentation; Habitat quality; Habitat size; Hinde's Babbler; Invasive plant; Land use; Single-large or several-small

Introduction

Ecosystems along East African rivers serve as important habitats for many endangered animal and plant species (McClanahan & Young, 1996) and in parallel provide important ecosystem services for people settling along these rivers and their livestock, such as a high ground water level, fertile soils, shade, wood and various (medicinal) plants (Enanga, Shivoga, Maina-Gichaba, & Creed, 2011). Wood is frequently used for timber, charcoal and the burning of bricks (Government of Kenya, 1981; Wyant & Ellis, 1990). This creates a conflict between human needs and nature conservation.

Today, most of the vegetation along these rivers is highly degraded as it was transformed into agricultural land to feed the growing human population or has been replaced by the invasive shrub species *Lantana camara* (Enanga et al., 2011). In consequence, the remaining vegetation exists in small and isolated remnant patches. The increasing level of fragmentation together with the decrease in habitat quality may negatively affect the local flora and fauna (Bosschieter, Goedhart, Foppen, & Vos, 2010; Richard & Armstrong, 2010). This situation may finally lead to the decrease in the density of local populations and may reduce individual fitness leading to local extinction (Boscolo & Metzger, 2011).

The globally vulnerable Kenyan endemic bird species *Turdoides hindei*, Hinde's Babbler, occurs in small and geographically isolated population clusters across the Central and Eastern Kenyan high- and lowlands, preferably in thickets along rivers (Shaw & Musina, 2003). The agricultural intensification caused a strong decrease of these vegetation

structures and subsequently has led to a population decline of this bird species during the past decades (Shaw & Musina, 2003; Shaw, Musina, & Gichuki, 2003; Shaw, Njoroge, Otieno, & Mlamba, 2013a,b). Especially the populations at the south-eastern distribution margin are thought to suffer under high demographic pressure (Government of Kenya, 2014a,b) and the effects of climatic changes in our study area (Jaetzold, Hornetz, Shisanya, & Schmidt, 2007).

We assessed *T. hindei* in a highly fragmented environment along the Nzeeu River south of Kitui, East Kenya, where we performed a detailed land use mapping. We measured the time our study species spent in various environments, such as thickets varying in size and quality and further recorded human activities in the area. Based on this data we define zones of potential conflict between human activity and the bird species. In detail we raise the following three questions:

- (i) Does *T. hindei* show any habitat preferences in our study area?
- (ii) Does habitat performance (size, design, quality) influence the habitat suitability for *T. hindei*?
- (iii) Are overlaps between species' occurrence and human activities potential zones of conflict?

Materials and methods

Study species

Turdoides hindei occurs in cool and moist highland regions such as the foothills of Mount Kenya (Meru, Kirinyaga)

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