



Original article

The costs of migration: Injuries in migratory waterbirds along the west coast of India

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ABSTRACT

The long distant, transcontinental migration of shorebirds entails many well identified costs in terms of time, energy, and direct mortality risk. Injuries from debris or from human structures and activities were observed as the major reasons for the direct mortality of shorebirds during migration worldwide. We recorded injured birds in major coastal wetlands of Kerala, for a period of 15 years from 2005 to 2019. The injured birds were observed in 9 different sites in various districts of Kerala. The highest instances of injuries were observed in Kadalundi-Vallikunnu Community Reserve, the major wintering and stop over site of migrant shorebirds in the west coast of India. During the study period, fifty-eight individuals of shorebirds belonging to four families were found to be injured. The highest proportion of injuries was recorded among the families Scolopacidae and Charadriidae comprising long distance migrant shorebird species and the lowest among Laridae and Ardeidae. We recommend that environmental authorities pay special attention to minimize anthropogenic debris along the flyways used by migratory birds thereby reducing the risk of injuries to some of these species. Proactive measures such as removal of discarded fishing gear or plastic debris from wintering areas as well as stopover areas could greatly reduce injuries in migratory birds arising from anthropogenic sources.

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1. Introduction

Migration is considered to have evolved as an adaptation to exploit seasonal peaks in resource abundance while avoiding seasonal resource depletion during the non-breeding periods. Thousands of diverse populations of waterbirds and other migratory birds travel back and forth along migratory flyways (Boere and Stroud, 2006). Flyways are broadly defined areas over which birds migrate on a regular basis between breeding and non-breeding areas, including all areas used in between as staging areas and stop-over sites (Boere and Stroud 2006). The Central Asian Flyway (CAF) is

the smallest flyway (Aarif et al., 2014), in terms of area of coverage (Boere and Stroud, 2006), and least studied among the world's flyways with 80% of its population being unknown (Balachandran, 2006; Aarif et al., 2014). The CAF encompasses primarily the Indian subcontinent in the south and extends to the central portion of Russia and its surrounding areas (Davidson, 2003; IWSC, 2003). A high diversity of wader species uses the CAF during the course of their lives (Davidson, 2003; IWSC, 2003). The Indian coastlines cover wintering and stop-over grounds for shorebirds and other waterbirds in the CAF (Aarif et al., 2011; Aarif et al., 2014; Aarif et al., 2020; Aarif et al. 2021). There is much variation in migration patterns (Lok et al., 2015). Most shorebirds migrate and some are long-distance, transoceanic and transcontinental migrants (Warnock, 2010), that require high-quality staging sites, where they refuel before continuing their journey (Choi et al., 2009; Warnock, 2010; Battley et al., 2012; Hua et al., 2013).

Shorebirds worldwide have been suffering alarming recent declines (Pandiyan and Ashokan, 2016). Migratory shorebirds, particularly, are of conservation concern owing to their low reproductive rate, long migrations, and dependence on a wide variety of wetland

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