Journal of Asia-Pacific Biodiversity 9 (2016) 323–327

HOSTED BY

Contents lists available at ScienceDirect

Journal of Asia-Pacific Biodiversity

journal homepage: http://www.elsevier.com/locate/japb

Original article

Spring migration of mallards (*Anas platyrhynchos*) tracked with wild-trackers in East Asia

Tehan Kang [a,*], Young-Myong Kang [b], Wooseog Jeong [b], Oun-Kyong Moon [b], Hachung Yoon [b], Jida Choi [b], Hansoo Lee [a]

[a] Korea Institute of Environmental Ecology Inc., Yusunggu, Dajeon, South Korea
[b] Animal and Plant Quarantine Agency, Gimcheon, South Korea

ARTICLE INFO

Article history:
Received 29 April 2016
Received in revised form
21 June 2016
Accepted 27 June 2016
Available online 2 July 2016

Keywords:
breeding site
Korea
migration route
stopover site

ABSTRACT

Mallard is a dominant waterfowl species wintered in Korea. We researched the mallard spring migration route, stopover sites, and breeding sites. We used cannon nets in Central Korea to catch and attach 10 wild trackers (WT-200). The mallards' spring departure dates were from the end of March to early April. The spring migration route varied by individual mallards, with most moving through the North Korean east coast. Breeding sites were distributed among the interior of Northeastern China. The average distance to the breeding areas was 1,265 km [standard deviation (SD) = 491 km] and the average days spent from wintering site to breeding site was 25.3 days (SD = 19.2 days). The mallards used several stopover sites when on the spring migration route (average 3.3 ± 2.1, range 2–9). The time spent at the stopover sites was a minimum of 1 day to a maximum of 16 days. Wintering mallards in Korea showed various individual trends regarding spring migration timing, migration route, stopover sites, and usage days.

Introduction

Wild birds, especially waterfowl, are the primary vector of a highly pathogenic avian influenza. Avian influenza wildly spreads when moving through breeding sites and wintering sites (Newman et al 2009; Takekawa et al 2010). Mallard is a common water bird that migrates internationally and spreads avian influenza not only in East Asia but also in Europe (Keawcharoen et al 2008; Lee and Song 2013). The number of mallards, a dominant water bird species, that winter in Korea is around 100,000–200,000. Mallards winter in various environments such as bird sanctuaries, inland small rivers, and lakes (Kim et al 1997; NIBR 2012, 2013, 2015). Therefore, the possibility of spreading highly pathogenic avian influenza and the protection of water birds is based on the understanding of their moving patterns such as migration route, moving season, and breeding distribution (Krementz et al 2011). Wild animal migration research using a Global Positioning System (GPS) based transmitter is a method to track wild animals' habitat and migration of space and season. Based on international scale research, the GPS method can record a bird's migration season, route, and behavior (Aebischer and Robertson 1993; Yamaguchi et al 2008; Krementz et al 2011).

The home range of wintering mallards in Korea was narrow and showed very high water-dependent trends (Kang et al 2014). However, mallards in Japan use various migration routes and stopover sites (Yamaguchi et al 2008). To date, there is no detailed research in Korea or East Asia on mallards' long range migration and their habitat when migrating. We studied the mallards' migration route, distribution, stopover and breeding areas, and timing of migration movements using tracked wild trackers (WT-200; GPS-Mobile Phone based Telemetry, KoEco).

Materials and methods

Telemetry tracking

We captured 10 mallards using cannon nets in 2014 in central Korea along small rivers and attached wild trackers (WT-200). The wild animal tracking device (WT-200) attached areas are Icheon,

* Corresponding author. Tel.: +82 42 825 6477; fax: +82 42 825 6478.
E-mail address: nameistehan@gmail.com (T. Kang).

Peer review under responsibility of National Science Museum of Korea (NSMK) and Korea National Arboretum (KNA).

http://dx.doi.org/10.1016/j.japb.2016.06.009

Figure 1. Sites in Korea where mallards (*Ansa platyrhynchos*) were captured.

Cheonan, and Jeonju (Figure 1). These areas are in small rivers where the depth is shallow, velocity is slow, and there are multiple resting sand banks.

Captured mallards were immediately put on their backs for 10–20 minutes to stabilize them and were then selected by weighing the individual mallards. The maximum weight of the tracking device that can be attached and minimize the birds flying abilities is 5% of their body weight (Kenward 1985). Considering that the wild animal tracking device is 47 g (63 × 35 × 14 mm), we selected individuals that weighed over 1 kg. Wild animal tracking devices were attached in a back-pack style (Kenward 1985). For tracking mallards, WT-200 devices were used.

Wild tracker (WT-200), a newly invented telemetry device by the KoEco Inc. were used. The WT-200 is a new telemetry device based on the GPS (Global Positioning System) combined with WCDMA (Wideband Code Division Multiple Access) mobile phone system. This device when attached on wild animals will record the GPS coordinates at a given time interval and transmit the geographic coordinates at the presetting time of day using the public network of mobile phone system. Researchers can acquire the location data of tracking individual by accessing the tracking website. Therefore we checked the website to verify the mallards' survival and migration route. GPS locations were recorded once a day.

Data analyses

To find the mallards' migration route we analyzed the departure date from the wintering site, the arrival date to the breeding site, and stopover sites. We also analyzed the number of days the birds took to get from the wintering site to the breeding site and the duration of days at the stopover sites. The departure date of the wintering site is considered as the date the birds left Korea. Mallards breed right after they arrive at the breeding site (Arzel et al 2006) and an area is considered as a breeding site if the mallards do not move over 30 km over a period of a month. We decided on an arrival date with this method. The stopover site is defined as a spot that is used for 24 hours without moving over 30 km (Yamaguchi et al 2008). To analyze the spring migration route we used location data from the date of the attachment of the tracker until July 31.