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ORIGINAL ARTICLE

Breeding biology of the European Blackbird *Turdus merula* in orange orchards

Ali Zeraoula [a,b], Taqiyeddine Bensouilah [a,b,*], Hafid Brahmia [a,b], Zihad Bouslama [a], Moussa Houhamdi [b], Ahmed Kerfouf [c]

[a] *Laboratory EcoSTAq: Ecology of Terrestrial and Aquatic Systems, Faculty of Sciences, Department of Biology, Badji Mokhtar University, BP 12, Annaba 23000, Algeria*
[b] *Laboratory LBEE: Biology, Water and Environment, Faculty of Nature and Life Sciences and Earth and Universe Sciences, Department of Nature and Life Sciences, 8 May 1945 University, BP 401, Guelma 24000, Algeria*
[c] *Faculty of Natural Sciences and Life, Department of Environmental Sciences, Djillali Liabès University, BP 89, Sidi Bel Abbès 22000, Algeria*

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Abstract During two successive years (2013–2014), we studied the breeding ecology of the European Blackbird *Turdus merula* in Guelma province, north-east of Algeria. The study was carried out in orange orchards of the region. We investigated nest placement in the orange trees and determined the factors of reproductive failure at this study area. Nests were placed at low height (mean ± SD = 1.42 ± 0.04 m) and located near the trunk (mean ± SD = 0.61 ± 0.04 m). The breeding season occurred between mid-May and mid-June and the peak of egg laying took place during the first half of May. The mean clutch size was 2.96 ± 0.05, density of breeding pairs was 0.83 ± 0.30 p/ha. The breeding success reported in the present study was higher than that recorded in other studies. Predation was the leading cause of nest failure of the population under investigation. The present study shows that the orange orchards appear to be the preferred breeding area for Blackbird population.

1. Introduction

In birds, studies on reproductive biology vary from simple records of breeding in general avifaunal inventories to detailed studies based on monitoring of nests and the young. Information derived from these studies is essential for the improvement of avian life-history theory and the implementation of sound management and conservation actions for these species and their habitats.

* Corresponding author at: Biology Department, Faculty of Sciences, Laboratory EcoSTAq: Ecology of Terrestrial and Aquatic Systems, University of Badji Mokhtar, BP 12, Annaba 23000, Algeria.
E-mail address: bensouilah.taqi@yahoo.fr (T. Bensouilah).
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In a strong contrast with the North American and European bird faunas, for which basic life history data are available virtually for all species, a large proportion of the passerine avifauna remains poorly known in terms of reproductive biology in Algeria, despite intensive field work carried out by several researchers during the last few years (Adamou, 2011; Kouidri, 2013; Adamou et al., 2014; Bensouilah et al., 2014; Bensouilah, 2015; Brahmia et al., 2015; Kafi, 2015; Kafi et al., 2015).

The Blackbird *Turdus merula* is a common breeding bird all over Europe except for northern Scandinavia (Cramp, 1988; Desrochers and Magrath, 1993; Ludvig et al., 1995a; Hatchwell et al., 1996a, 1996b; Kurucz et al., 2012). Its distribution is reported to extend in North Africa (Heim de Balsac and Mayaud, 1962; Cramp and Perrins, 1994; Isenmann and Moali, 2000; Selmi, 2007; Adamou et al., 2014), eastern Asia (Lu, 2005) and even Australia (Kentish et al., 1995). Classified as one of the most frequent passerines in the Palaearctic region, the European Blackbird is adopted to a variety of ecological niches, occurring in woodland, farmland and suburban habitats (O'Connor and Shrubb, 1986; Marchant et al., 1990; Gibbons et al., 1993; Wysocki, 2005; Selmi, 2007; Kurucz et al., 2012; Taberner et al., 2012; Adamou et al., 2014; Wysocki et al., 2015).

The European Blackbird *T. merula* is common in most habitats of north-eastern Algeria, displaying a preference for urban bush land, parks, gardens and horticultural areas. It has colonized many types of natural habitat from the coast to the northern border of the Sahara (Isenmann and Moali, 2000; Adamou, 2011; Adamou et al., 2014), but it avoids the high plateaus (Heim de Balsac and Mayaud, 1962). In Algeria, there have been a few studies on the breeding of the European Blackbird (Heim de Balsac and Mayaud, 1962; Isenmann and Moali, 2000; Adamou, 2011; Adamou et al., 2014), but detailed information on life history traits of this species such as egg laying date, clutch size, daily survival rates, nest placement and the main causes of nesting failure remains unreported. Thus, we present, in this paper, preliminary data on the breeding biology of the Common Blackbirds in Algeria.

2. Methods

2.1. Study area

Field data were collected from five orange orchards (25 ha in total), chosen at random, located at the middle part of the Seybouse River in Guelma province, north-east of Algeria considering that farmlands around the watershed of the Seybouse River were extensively used by many passerines (Bensouilah et al., 2014; Bensouilah, 2015; Brahmia et al., 2015; Kafi, 2015; Kafi et al., 2015).

Guelma province (36°46′ N, 7°28′ E) is located 60 km from the extreme north Algeria at an altitude of 279 m above sea level, covering an area of 3686.84 km^2 mid of the northern high plateaus and the Mediterranean sea. The study area has an annual average temperature of 17.3 °C (winter 4 °C, summer 35.4 °C) and an annual mean rainfall of 654 mm with a subhumid climate, mild and rainy winter and hot summer (Bensouilah et al., 2014; Bensouilah, 2015).

The region is characterized by a diverse terrain where forest and agricultural landscape, occupy 27% and 65% of the total area, respectively. The cereals, mainly the Durum wheat (*Triticum durum*) and barley (*Hordeum vulgare*), cover 46% of the total area used, whereas fallow lands and fruit farming occupy respectively 33% and 3% of the total area used (URBACO, 2012; Bensouilah, 2015).

On each side of the Seybouse River, intensive fruit farming has been recently established which consists mainly of orange, lemon and loquat orchards (Bensouilah et al., 2014; Bensouilah, 2015; Brahmia et al., 2015; Kafi, 2015; Kafi et al., 2015).

2.2. Data collection

During two consecutive breeding seasons 2013–2014 (March to June), the Blackbird nests were opportunistically observed over the study area. Data related to the density of couples and monitoring of reproductive phenology (laying, hatching and fledging) were collected from orange orchards with an area of 25 ha adopting a sampling transect type by systematic searching of nests in the trees and/or by following birds performing nesting behaviour. We used survey numbered flags placed on the trees to mark the nest for relocating it again and monitor the nests. We searched for nests in the morning, since individuals are more active at that time of day (Bensouilah et al., 2014; Bensouilah, 2015; Brahmia et al., 2015).

Once a nest was located, it was inspected regularly (after every 3–4 days), and at each visit its contents were checked to ascertain it's reproductive progress by determining the laying dates, hatching and fledging dates, clutch size, brood size, incubation duration, fledging duration and reproductive success. For some clutches, where incubation already had begun or nestlings were hatched, we determined their egg-laying dates by back-dating from the reproductive parameters of other completed clutches. For this purpose, it was assumed that incubation began when the last egg was laid and it was estimated on the basis of a 12-day incubation period (Hatchwell et al., 1996b). The breeding season was defined as the time between the dates of the first egg being laid in the earliest and latest located nests. The maximum number of simultaneously active nests during a successive period was used to calculate the density of pairs of Blackbirds (Bensouilah et al., 2014; Bensouilah, 2015).

The present study considers breeding attempt a success if at least one young survived to fledge and/or observation of an empty nest with droppings arranged around its periphery which coincided with the post-flight, observation chicks before fledging at the age of 12–14 days and no trace of predation of chicks. Clutches were considered as complete when the number of eggs did not change between successive nest inspections and when hatching was noted. Breeding success was estimated following Mayfield (1961).

The productivity was estimated as the number of fledglings produced per breeding attempt (Kelleher and O'Halloran, 2006; Bensouilah et al., 2014; Bensouilah, 2015; Brahmia et al., 2015) was calculated as follows:

$$\mathrm{FPA} = \mathrm{CS} \times \mathrm{CER} \times (1 - \mathrm{EFR})^{\mathrm{EP}} \times (1 - \mathrm{NFR})^{\mathrm{NP}}$$

where FPA = number of fledglings produced per breeding attempt, CS = clutch size, CER = chick: egg ratio,