

FIRST URBAN BREEDING OF TRUMPETER FINCH *BUCANETES GITHAGINEUS* IN THE SAHARA DESERT IN ALGERIA.

ChoaybBounab*, #, El-YamineGuergueb*, SoumiaHaddad*, AmriaAbed*
, OumymaZouatine**, RadhiaBiad*, YassineNouidjem***

*Laboratoire Valorisation et Conservation des Ecosystèmes Arides, Faculté des Sciences de la Nature et de la Vie et Sciences de la Terre, Université de Ghardaïa, 47000 Ghardaïa, Algeria ;

**Laboratoire BioRessources Sahariennes, Préservation et Valorisation, Faculté des Sciences de la Nature et de la Vie, Université Kasdi-Merbah, Ouargla 30000, Algeria;

*** Faculty of Science University of Msila PO box ichebilila, 28000 M'sila, Algeria.

Abstract

The subspecies *Roselin githagine Bucanetes githagineus zedlitzii* is found in arid and semi-arid environments of North Africa. In this study, we tracked this species in an urban landscape within a Saharan region to evaluate the impact of the urban gradient on its distribution, to characterize the reproductive parameters in an urban environment, and to report the first case of nesting of this species, in an urban setting. Over a seven-month study period, we regularly visited 90 listening points distributed in three habitats (urban, suburban, and rural). Statistical analysis of the data, using one-way analysis of variance (ANOVA) for recent counts in the three habitats, showed a significant result with a p-value of 0.04, indicating a significant difference between the different habitats. Furthermore, the study of the reproductive parameters of this species revealed that the population had a late laying date and relatively larger egg dimensions compared to other populations studied in Algeria.

Keywords: *Bucanetes githagineus*, Birds, Breeding, Urban landscape, Algerian Sahara.

INTRODUCTION

The trumpeter finch (*Bucanetes githagineus*, Lichtenstein, 1823), a small, dumpy, (around 21g) stout-billed, sandy-coloured, round-headed finch (Beaman and Madge, 2010) with stubby bulbous, bill bright pink in breeding male (Redman et al., 2016) rather short tail. Uniform wings and tail show from traces of pink (Grimmett et al., 2008) in the finch family Fringillidae East (Barrientos et al., 2009; Barrientos et al., 2014; Carrillo et al., 2007). This is granivorous fringillid distributed throughout the arid regions of the Western Palaearctic from the Canary Islands to the Middle East (Barrientos et al., 2009; Barrientos et al., 2014; Beaman and Madge, 2010; Carrillo et al., 2007)

The breeding range of this species from North-west India as far as North Africa (Fedorenko, 2022). The Asian subspecies is known as *B. g. crassirostris*. (Barrientos, 2015; Hubert, 1988), the northern boundary of the distribution area in the Middle East, through, Syria and Iran (Hubert, 1988), in Central Asia has been found in Kazakhstan, Uzbekistan, Turkmenistan and Tajikistan, (Fedorenko, 2022), Afghanistan, Pakistan (Barrientos et al., 2009), describes it as a resident and nomadic species (Hubert, 1988), *B. g. zedlitzii* its North Western African subspecies distributed in Tunisia, Algeria

Corresponding author

and Morocco (Barrientos et al., 2009; Isenmann and Moali, 2000; Kouidri et al., 2017), Race *amantum* of the Canaries is darker than *B. g. zedlitzii*, being browner and rosier (Beaman and Madge, 2010; Parkin et al., 2004).

In Algeria the breeding subspecies is *B. gzedlitzii* (Beaman and Madge, 2010; Isenmann, Moali, 2000; Parkin et al., 2004) their northern limit of breeding range from Aurès to the north of Biskra, Bousaada, Aflou (Isenmann and Moali, 2000; Kouidri et al., 2017). In the south, the breeding range reaches the Niger and Mali (Isenmann and Moali, 2000).

The objective of our study is *i*) to monitor the phenology of the Roselin githagine population in an urban landscape in the Ghardaia region, *ii*) to determine the effect of the urban gradient on the spatial distribution of this species, and *iii*) to characterize the reproductive biology of this species in this urban landscape.

MATERIAL AND METHOD

Study areas

The study area is situated at the Ghardaia region in the North of the Central Algerian Saharan region (32°30'N, 3°45'E). This Saharan city covers 306 km² and has approximately 93 423 inhabitants (Sadine et al., 2016) and located at an altitude ranging 489 m (Figure 1.).

The climate is Saharan dry with extreme thermal amplitudes between the day and the night, reaching 15–16 °C. The coldest month is January with a minimal temperature of 5.1 °C, whereas the hottest month is July with a maximum temperature of 41.8°C. The average annual temperature varies between 16.5 and 27.5°C, Rainfall is extremely low in the region of Ghardaïa with an average value of 80.10 mm per year (Boutmedjet et al., 2022; Chikhi et al., 2022). Analysis of dry periods over several years attest that 12 months are dry, ranging from January to December (Chikhi et al., 2022).

Estimation of the population

The population count of the Roselin githagine was conducted from December 2022 to May 2023 in the Noumerat city, located 20 km from the capital of the Ghardaïa province, on national road 1 towards El-Menia. During this period, a total of 90 listening points were surveyed, beginning 30 minutes after sunrise and ending all surveys before 10:00 am, to coincide with the birds' peak activity period. Each listening point covered an area of approximately 0.7854 hectares, within a radius of 50 meters and a distance of 200 meters from the nearest point. All individuals of the species seen or heard were recorded for 10 to 15 minutes at each point.

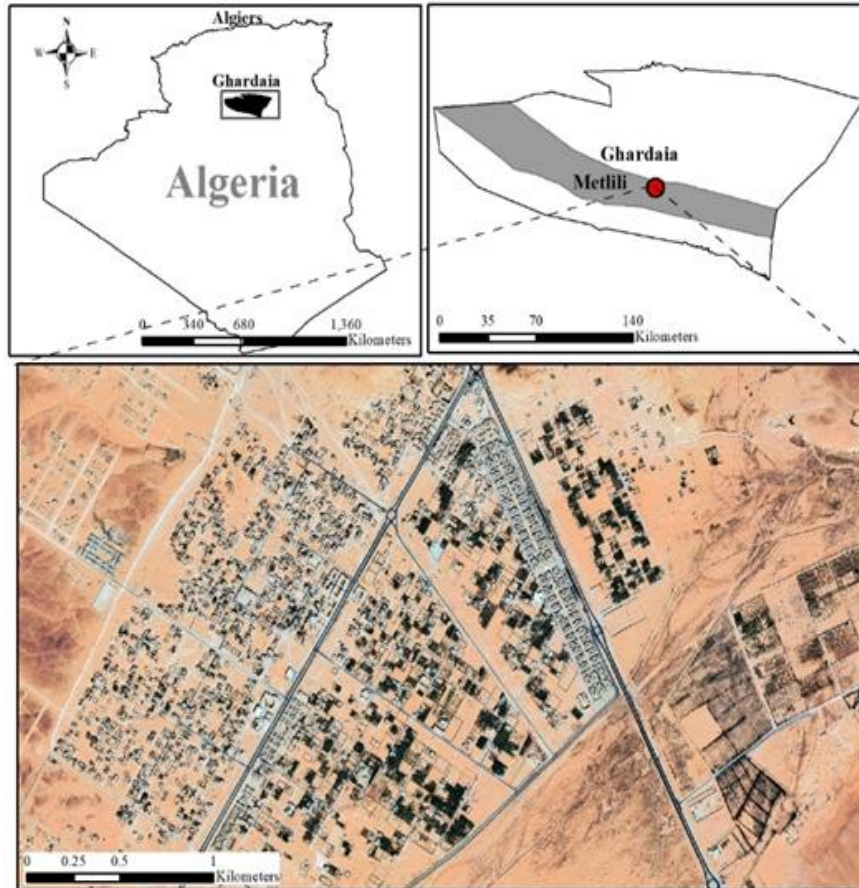


Fig.1. Map of the geographical allocation of the study area.

Classification of habitats

Three categories of habitats have been chosen using satellite images (Google Earth) and visual estimations on the ground: 1) *Urban habitat*: highly urbanized with a building density exceeding 80%, 2) *Suburban habitats*: represent intermediate habitats characterized by the presence of plantations and natural environments or building density between 30% and 80%. 3) *Rural habitats*: also known as agricultural zones, are sparsely urbanized areas usually located on the outskirts of the city, dominated by the date palm (*Phoenix dactylifera*), fruit trees (orange, pomegranate, lemon, etc.), vegetable crops, and spontaneous plants (building density >30%).

RESULTS

Phenology of the Trumpeter Finch in the study area.

The presence of the Trumpeter Finch in the Noumerat city was only reported from December, with relatively low numbers in the 15 counting points surveyed in different habitats. Over the next two months, the distribution of individuals became balanced, with around 15 individuals observed in each habitat. The numbers of this species experienced a clear growth in the suburban habitat during the last three months, reaching a maximum of 32 individuals (Figure 2.).

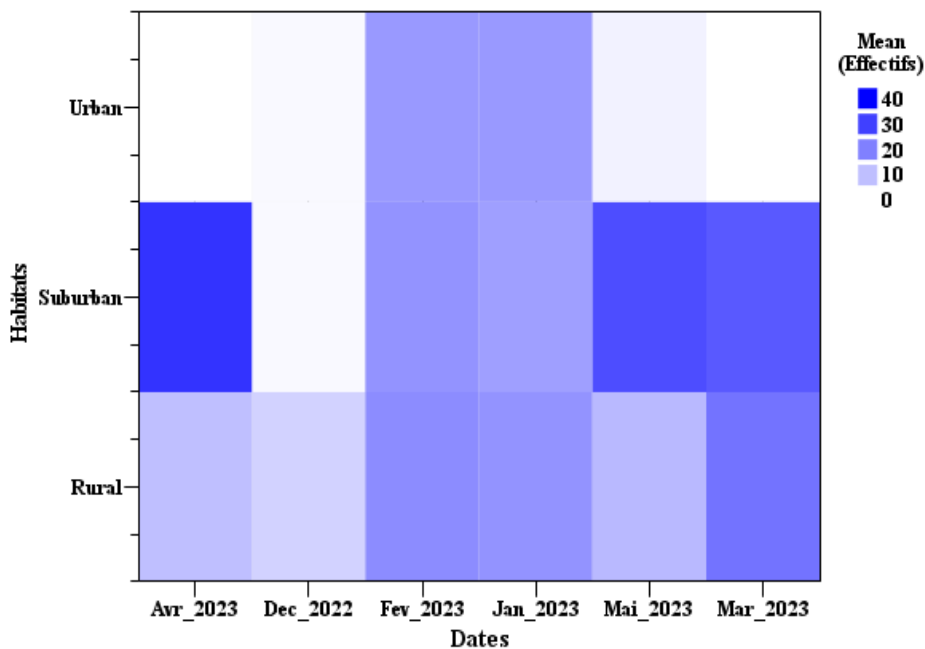


Fig. 2. Spatio-temporal variation in the mean abundance of the Trumpeter Finch in the study area.

The spatiotemporal distribution of the Trumpeter Finch among different habitat types showed a significant difference (one-way ANOVA: $F(2,15) = 4.005$, $P < 0.04$). The urban habitat had occupied at least 5 individuals throughout the study period with an average of 5.83 ± 7.55 individuals, which was significantly lower than the numbers in the suburban area (mean = 19.83 ± 12.75 individuals) and the modern urban environment (mean = 14.16 ± 7.47 individuals) (Figure 3.).

Breeding biology

During our investigation in the 2022 breeding season, we observed two open cup-shaped nests. These nests were mainly constructed with goat hair, feathers, and plant debris. They were located in hollow concrete block walls, at an average height of 165 ± 15.56 cm from the ground. The two nests were located on opposite walls, 20 m apart, one facing south and the other facing north. The nests had an outer diameter of 8.45 ± 1.48 cm, an inner diameter of 4.85 ± 0.49 cm, and a depth of 2.65 ± 1.63 cm. (Figure 4.)

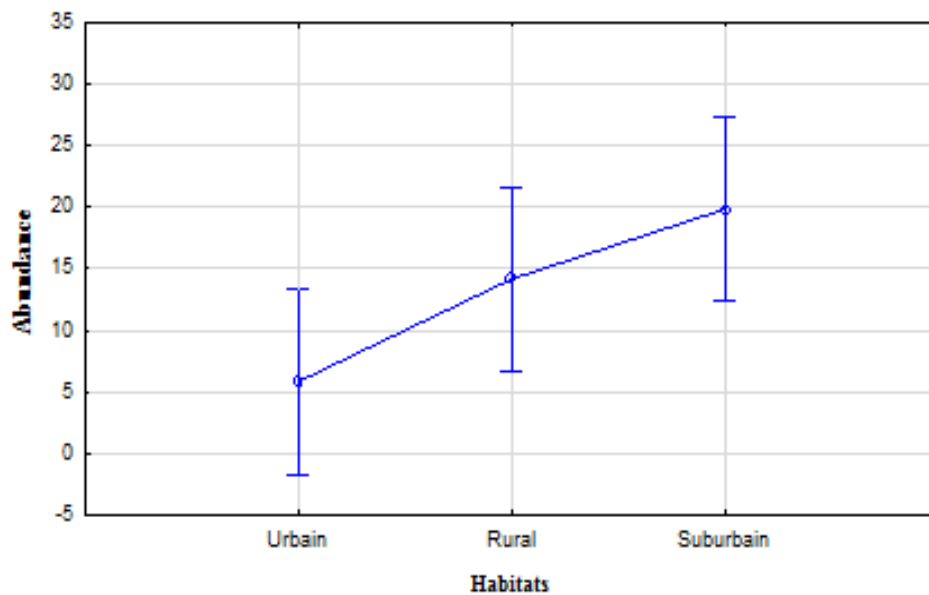


Fig. 3. Graphical presentation of mean abundances using ANOVA tests between habitats.

Both clutches were recorded during the first week of May, with a clutch size of 4 and 5 eggs, and an incubation period of 13 days.

The eggs were pale blue with small spots of rust to black-purple color. The weight of the eggs ranged from 1.66 to 2.18 g (1.97 ± 0.24 g). Their length ranged from 1.94 to 2.22 cm (2.11 ± 0.135 cm), and their width ranged from 1.46 to 1.55 cm (1.51 ± 0.039 cm). The average volume of the eggs was 2.45 ± 0.28 cm³ (Table 1.).

DISCUSSION

The Trumpeter Finch is the species of the Fringillidae family that is regularly present in the M'Zab region with significant numbers (Chedad et al., 2020, 2023). It reached 270 individuals in July 2019 in the rocky plains

of the wetland area of Kaf Dokhan (Ghardaia) (Chedad et al., 2020), which means that this species prefers environments far from urban areas.

Their presence in our urban landscape with more or less low numbers, reaching 51 individuals during the month of February, with a homogeneous distribution between the three gradients of the urban landscape.

At the beginning of the breeding period, which is in April and May, the Trumpeter Finch mainly colonizes sub-urban and rural habitats to feel safe away from humans. It finds its food thanks to the presence of plantations and spontaneous plants. In general, this species frequents sub-urban habitats.



Fig. 4. Photography of different stages of development **a)** Nest with eggs **b)** Chicks **c)** Sub-adults of the Trumpeter Finch **d)** Nest locations.

The Trumpeter Finch is a species of steppes that places their nests under clumps of alfa on steep slopes. Though nesting on cliffs can be advantageous against predation (Barrientos et al., 2009b), it has never been found above (Kouidri et al., 2017) in natural environments in the Tabernas desert, far from the nearest settlement about 10km (Barrientos et al., 2007, 2009a, 2009b).

Table 1.

Measurements of eggs and nest characteristics in the Trumpeter Finch nesting in the Sahara Desert of Algeria. Values are expressed as mean \pm SD and range (min–max)

Variables	Mean \pm SD	Range
Eggtraits (n=5)		
Weight [g]	1.97 \pm 0.24	1.66-2.18
Breadth [cm]	1.51 \pm 0.039	1.46-1.55
Length [cm]	2.11 \pm 0.135	1.94-2.22
Volume [cm³]	2.45 \pm 0.28	2.1- 2.70
Nestcharacteristics (n=2)		
Externaldiameter (cm)	8.45 \pm 1.48	7.4-9.5
Internaldiameter (cm)	4,85 \pm 0.49	5.2-4.5
Nestingheight (cm)	2.65 \pm 1.63	1.5-3.8

Nests were followed in a steppe ecosystem dominated by Alfa *Stipa tenacissima* L. (Poaceae) in the presence of Phoenician juniper *Juniperus phoenicea* L. (Cupressaceae) and Cade J. juniper *Oxycedrus* L. (Cupressaceae). It has also been observed nesting in natural crevices between rocks on clay-gravelly slopes in Kazakhstan (Fedorenko, 2022). However, what makes our study unique is that we report and follow the breeding of the Trumpeter Finch in an urban area, within a rocky desert.

In our urban study area, the start of reproduction is delayed compared to other populations in natural habitats (Barrientos et al., 2009; Clement, 2020; Heim de Balsac and Mayaud, 1962; Tabib et al., 2017). The start of the breeding season may vary depending on climate changes (cold and hot years) as well as food availability (Barrientos et al., 2007; Barrientos, 2015). We detected the two clutches during the first week of May, while the breeding season for the high plateau population lasts from mid-March to the end of June (Kouidri et al., 2017) and from February to June for the populations of Canaries islands and Morocco (Clement, 2020).

This species shows similarities with the Saharan Bunting (*Emberizasahari*) that breeds in the same region, in terms of nest site selection, nest location, and composition, as reported in the studies of Chedad et al., 2021 and Zouatine, 2020. The nests are usually built in less frequented areas by humans, at an average height of 200 cm. The materials used include elements of plant and animal origin such as feathers, goat hair, and sheep wool.

The clutch size recorded in our study area is within the range of this species (Barrientos et al., 2009; Clement, 2020; Heim de Balsac and Mayaud, 1962; Isenmann and Moali, 2000; Kouidri et al., 2017). The egg dimensions were relatively larger compared to the population of the Saharan Atlas (Kouidri et al., 2017). Several factors related to the female influence the egg characteristics, such as age, weight (Christians, 2002), body condition, and food availability (Meijer and Drent, 1999).

The incubation period of the Trumpeter Finch nesting in the Ghardaïa region is similar to the other Algerian population in the Aflou region (Kouidri et al., 2017) and with other populations such as the population of the Tabernas desert in the Iberian Peninsula and the population of the Canary Islands (Barrientos et al., 2009).

CONCLUSION

The Trumpeter Finch, which is regularly present in the Ghardaïa region, mainly frequents habitats with medium urban density, especially during the breeding period.

We reported for the first time nesting in an urban environment, which distinguishes it from Algerian populations and other populations in West Africa and the Iberian Peninsula.

All reproduction parameters are within the normal range for this species, except for the laying date, which is later, and the egg dimensions, which are relatively larger compared to other populations studied in Algeria.

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