BREEDING ECOLOGY OF THE EUROPEAN ROBIN (*ERITHACUS RUBECULA*) IN THE KABYLIE OF THE BABORS (ALGERIAN NORTHEAST)

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ABSTRACT

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The breeding ecology of the Robin Erithacus rubecula was studied in Kabylie of Babors from Algeria, during three years (2016, 2017 and 2018). The breeding season was earlier (March 31) and the clutch sizes were lower (4.15 ± 0.36) compared to their congeners in the Iberian Peninsula. The breeding success at fledging was 2.25 chicks per nest and human disturbance accounted for most of the losses. Robins used up to 23 different plant taxa for nest construction, although the number of different plant species varied from 10 to 14.

Keywords: Algeria, breeding, *Erithacus rubecula*, fecondity, nest.

INTRODUCTION

The European Robin (*Erithacus rubecula*) is one of the most widespread and abundant birds in Europe (Cramp, 1988), its nesting territories become more fragmented and localized in the mountain forests at the southern edge of its distribution range in North Africa (Isenmann & Moali, 2000; Thévenot *et al*., 2003; Bougaham & Moulaï, 2014). It has been the subject of several more detailed etho-ecological studies in Europe (Adriaensen & Dhondt, 1990; Figuerola *et al*., 2001; Tellería *et al*., 2001; Pérez-Tris & Tellería, 2002). Only a few studies have focused on the breeding ecology which is still little known throughout its range (Lack, 1965; Roff, 1992; Stearns, 1992).

In Algeria, the nesting territories of the species are located in rare moist forests in the north of the country (Heim De Balsac & Mayaud, 1962; Ledant *et al*., 1981; Isenmann

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& Moali, 2000; Bougaham & Moulaï, 2014). In winter, migratory individuals join their sedentary congeners (Isenmann & Moali, 2000) and forest habitats are the first to be occupied. The sedentary population is more abundant in forest habitats "nesting habitats", while migrants predominate in open habitats where the species rarely breeds (Bougaham & Moulaï, 2014).

It is desirable to determine the different breeding parameters of this forest songbird at the southern edge of its range in Algeria. Available nesting information for this species is sparse and incomplete: the breeding season spread out from mid-April to mid-May, and the clutch size ranged from 4 to 5 eggs per nest (Heim De Balsac & Mayaud, 1962). Accurate data on laying dates, breeding success at hatching and fledging, and using nesting materials have not been published.

MATERIAL AND METHODS

Study zone

The study area was located in the foothills of the north slope of Jebel Tababort, southeast of the town of Bejaia, 5 kilometers from the capital of Tameridjet municipality (Figure 1). The vegetal landscape develops on a substratum formed by liasic limestones (Duplan, 1955). The cork oak forests *Quercus suber* dominate this landscape and alternate with food and pasture crops that extend around Akkache village (36 ° 34'33.74 " N, 5 ° 24'05.66 " E) (Figure 1). The vegetation surrounding the cultivated land is mainly represented by *Fraxinus angustifolia*, *Ulmus campestris*, *Olea europea* and other fruit trees such as *Citrus sinensis* and *Ficus carica*. The region’s climate is Mediterranean, with mild winters and dry summers (Seltzer, 1946). Annual precipitation averages 940.5 mm (Bougaham, 2016). The dry period is less than 3 months and the frequency of fog, in the mountains of the region especially during the summer, reduces the intensity of the drought.

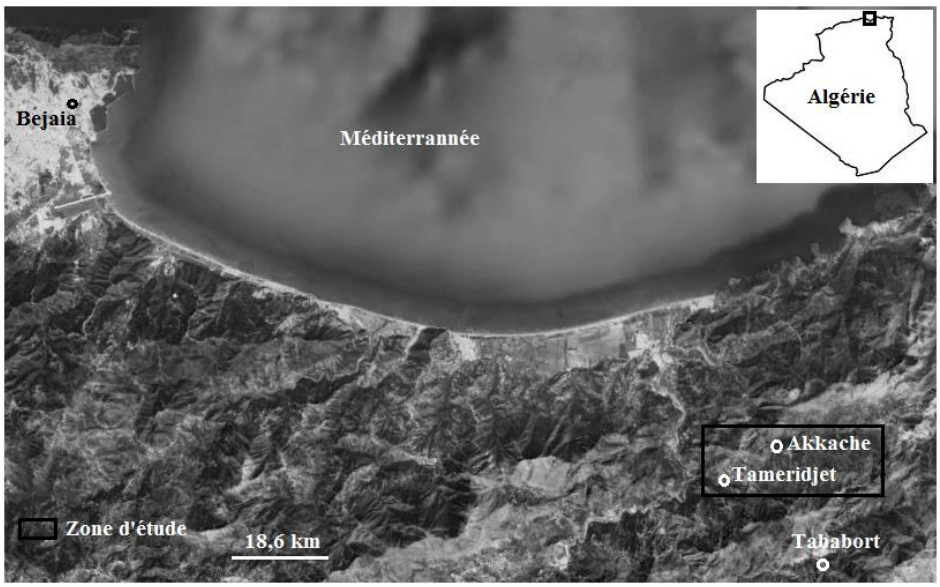

Figure 1. **Geographical location of the study area.**

Methodology

The nesting of the European Robin was monitored during the period of 2016, 2017 and 2018. The search for nests was carried out in the upland forests of the Tababort region in the Tameridjet municipality, but also at the level of the orchards installed in the clearings of these forests. A systematic search for nests was conducted mainly along the walking trails. The breeding study was carried out under optimal meteorological conditions (no wind, no rain) which ensure the determination of the nesting territories, because adults showed restricted activity around the nest where were easily located. A total of 20 actives nests of this species were monitored during the study period. Each week we made 2 to 3 visits per nest.

The dates of the first eggs laid were known by direct observation, they were expressed in the corresponding year day (January 1^{st} = the first day of the year).

At the end of the breeding season, the horizontal distances between nest locations and walking trails were taken using a decameter. Three nests were retrieved and each was weighed separately. The materials used for the nest-building were divided into three categories and each type of material was weighed separately: woody plants, herbaceous plants and various materials (feathers, hair, and plastic threads). The materials used for nest-building could be identified after separation.

The number of eggs per nest has been determined. In the case of nests abandoned in the egg stage, the length and the largest width of each egg were measured using calipers

(precision: 0.1 mm). Breeding success at hatching is equal to the number of eggs hatched per nest and fledging was estimated by the ratio of the number of fledglings per nest.

RESULTS AND DISCUSSION

The number of nests monitored differs between the years (Table 1). The nesting sites were located between 286 and 680 meters above sea level (Table 1). The majority of nests were located close to walking trails. Nests were placed in embankments (n = 7) or directly under a stone (n = 13, Figure 2) under plant tufts (roots of Fig tree, Dis, Lentisk, Moss, Nettle, Heather and Phylar), and the distance between the nest and the nearest hiking trail varied between 0.20 and 50 meters (average: 9.65 ± 14.16 meters). Most nests were found in cork oak forests (n = 12, 60%) and abandoned crop sites were also selected for nesting of this species (n = 7, 35%). A single case of nest was located in a bush of *Pistacia lentiscus, Calycotome spinosa* and *Ampelodesmos mauritanica*.

Table 1. Location (meter) and distances (meter) between the nest locations and walking trails.

Year	N	Altitude	Distance
2016	8	Extremes: 286-680	Extremes:1.60-30
		376.37 ± 127.67	7.27 ± 9.33
2017	4	Extremes: 307-379	Extremes: 0.2-10
		365.25 ± 52.23	3.25 ± 4.56
2018	8	Extremes: 453-306	Extremes: 0.90-50
		359 ± 53.52	15.22 ± 1.95
Total	**20**	**367.20 ± 86.92**	**9.65 ± 14.16**

Figure 2. **Adult of European Robin brooding eggs.**

The laying dates range from late March (first egg laid March 30, 2016) until early May (first egg of the last clutch laid May 10, 2017) (Table 4). The average dates of the first laid egg were grouped around April 18 (108 days ± 10.47). These egg-laying dates do not match those taken from different populations of the Robin of the Iberian Peninsula (May 6-June 1, Pérez-Tris & Tellería, 2002), which gives advance of one month for the robins in our study area.

The average mass of the nests (n = 3) varied between 33.80 and 53.80 grams, that is an average of 42.06 grams (± 10.44, n = 3). An average mass of plant material equal to 41.88 grams (± 10.46, extremes: 33.60-53.65, n = 3) was noted and the proportion of other materials was less than 1% (Table 2).

Table 2. **Mean weight of plant material used in nest-building by European Robin.**

Nests	Average mass of nests (g)	Average mass of plant material (g)	Herbaceous (in % of plant material)	Woody (in % of plant material)	Various materials (in % of total)
Nest 1	38.60	38.40	44.30	53.10	0.38
Nest 2	33.80	33.60	80.71	18.63	0.59
Nest 3	53.80	53.65	66.91	30.11	0.27
Means (± sd)	**42.06 ± 10.44**	**41.88 ± 10.46**	**63.97 ± 18.38**	**33.94 ± 17.55**	**0.41 ± 0.16**

Herbaceous materials were the most frequently used (n= 3, 63.97 ± 18.38) and the average percentage of woody plants was 33.94% (± 17.55, n = 3; 2). The number of plant taxa used for nests-building ranged from 10 to 14 taxa (Table 3), a total of 23 taxa (n = 3, all nests combined).

Table 3. **Plant taxa used for nest-building by European Robin.**

Nest 1	Nest 2	Nest 3
Quercus suber	*Quercus suber*	*Salix* sp.
Poaceae sp_1.	Poaceae sp_1.	*Rubus ulmifolius*
Celtis australis	Poaceae sp_2.	*Ampelodesmos mauritanica*
Rubus ulmifolius.	*Ulmus campestris*	*Bryum* sp.
Fraxinus angustifolia	*Bryum* sp.	*Pteris aquilina*
Ampelodesmos mauritanica	*Ampelodesmos*	*Crataegus monogyna*
Bryum sp.	*mauritanica*	*Bromus* sp.
Pteris aquilina	*Galactites tomentosa*	Poaceae sp_3.
Citrus sp.	*Genista* sp.	*Calycotome spinosa*
Pistacia lentiscus	*Pistacia lentiscus*	*Asphodelus microcarpus*
Calycotome spinosa	*Calycotome spinosa*	
Erica arborea	*Erica arborea*	
Urtica sp.	*Origanum* sp.	
Ceratonia siliqua		
14 taxa	**12 taxa**	**10 taxa**

The number of eggs per nest ranged from 4 (n = 17) to 5 (n = 3), the clutches with 4 eggs were the most frequently observed (85%). The mean value of complete clutch was 4.15 eggs (± 0.36). Mean clutches of the three breeding seasons appear different; they are 4 eggs for 2016, 4.25 eggs for 2017 and 4.10 eggs for 2018 (Table 4). The number of eggs per nest in this Robin population is smaller than that found in the Robin populations of the Iberian Peninsula where the majority of the nests contained more than five eggs (Stearns, 1992).

Table 4. First-egg date, clutch size and breeding success at hatching and fledging. N: Number of nests.

Year	N	First-egg date	Clutch size	Hatching	Fledging
2016	8	March 30	4	0-4	0-4
Total		-	4	4.12 ± 0.35	3 ± 1.60
2017	4	April 10	4-5	0-4	0-4
Total		-	4.25 ± 0.5	2 ± 2.30	1 ± 2
2018	8	April 6	4-5	0-5	0-5
Total		-	4.25 ± 0.46	2.62 ± 2.26	2.12 ± 2.29
Total	**20**	**-**	**4.15 ± 0.36**	**2.85 ± 1.95**	**2.25 ± 2.02**

The length of the recovered eggs varied between 1.81 and 1.90 cm, with an average of 1.87 cm (± 0.05, n = 8). The largest egg width is between 1.56 and 1.60 cm (1.58 ± 0.02, n = 8).

Breeding success at hatching is 2.85 (± 1.95, n = 20) nestlings per nest. It varies considerably between the three years studied (Table 4), with a success of 4.12 for 2016, of 2 for 2017 and 2.62 nestlings per nest for 2018. The mortality rate of chicks after hatching (n = 12) and the number of nests abandoned at the egg stage (n = 2) would seem important. The number of fledged young is low (n = 20, Table 4). Low productivity may be related to the effects of human disturbance where the nests were located on the ground near walking trails. This effect is accentuated where a sudden cold spell or heavy rain at a crucial point in the nesting period could have affected hatching and fledging success.

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