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Breeding biology of the black kite *Milvus migrans* (Accipitridae) at Ras El Ma ravine (Guelma, northeast Algeria)

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Abstract
The Black Kite *Milvus migrans* is a common species in northeast of Algeria. Data on the breeding ecology and biology of this bird was well collected all over the world, but in Algeria the population of Black kite are still not known. This study was carried out during 2015 at Ras El Ma ravine (Guelma, northeast of Algeria) in order to characterize the phenology and biology of the breeding of this raptor. The breeding population of black kite was present from March to September with a peak of 28 individual noted at the first week of August. The egg-laying started from April. 36 nests of black kite were surveyed during the breeding season. The first chick had fledged from July 16th. A total of 15 eggs were measured during our study the mean egg length, breadth, weight and volume were 55 ± 2.33 mm, 43 ± 2.11 mm, 103.66 ± 1.2 g, 51.76 ± 1.2 cm^3 respectively. The clutch size of the black kite varied between 1 and 3 eggs.

Keywords: Black kite, raptor, Guelma, Ras El Ma ravine, breeding, egg-laying

1. Introduction
The black kite *Milvus migrans* is one of the common and abundant raptors in Algeria. This species was cited as a declining and vulnerable species in Europe [1], in Portugal, Eastern Europe and Russia this raptors has decreased in number [2, 3]. Several studies of it is breeding ecology around the world were done, mainly in Europe [4-7] and in Japan both in a mountainous region [8] and in the vicinity of a fishing-port [9]. Also, the allocation of individuals within a species' range is mainly influenced by the distribution of suitable habitat as well as the distribution of competitors, predators, and/or the dynamics of resources [10]. In addition, the ecological parameters such as: egg-laying, clutch size and laying date of birds especially the raptors are influenced by the diet and food intake [11, 12]. In this paper, we are reporting the breeding ecology of the black kite *Milvus migrans* in one of the preferential site of this raptors in Guelma province: Ras El Ma ravine (northeast of Algeria), this study was carried out during the breeding season 2015 in order to report the breeding pairs density, the phenology of this species, all breeding activities (nests and eggs characteristics, nest-site selection) and the diet of this species.

2. Materials and methods
2.1 Study area
Guelma province is situated in northeast of Algeria and covers an area of 3687 Km^2 (Figure 1). The northern part of this town is characterized by a sub-humid climate but southern part by semi-arid climate [13]. The mean temperature varies between 4 °C in winter and 41 °C in summer and annual precipitation varies between 654 and 1000 mm. Guelma province is dominated by a forest landscape (31.70% of the total area 116865 ha). Cereals mainly the durum *Triticum durum* and the barley *Hordeum vulgare* cover an area of 85 ha (46% of the agricultural area) [14].
Ras El Ma ravine (36°15,756N, 07°29,074E) (length: 68 m and elevation: 27 m) is one of an important cliff of the region, it is located in Bouhachana district (Figure 1). During the breeding period, this cliff is frequented by many raptors therefor it is an important nesting site in northeast of Algeria (Figure 2).

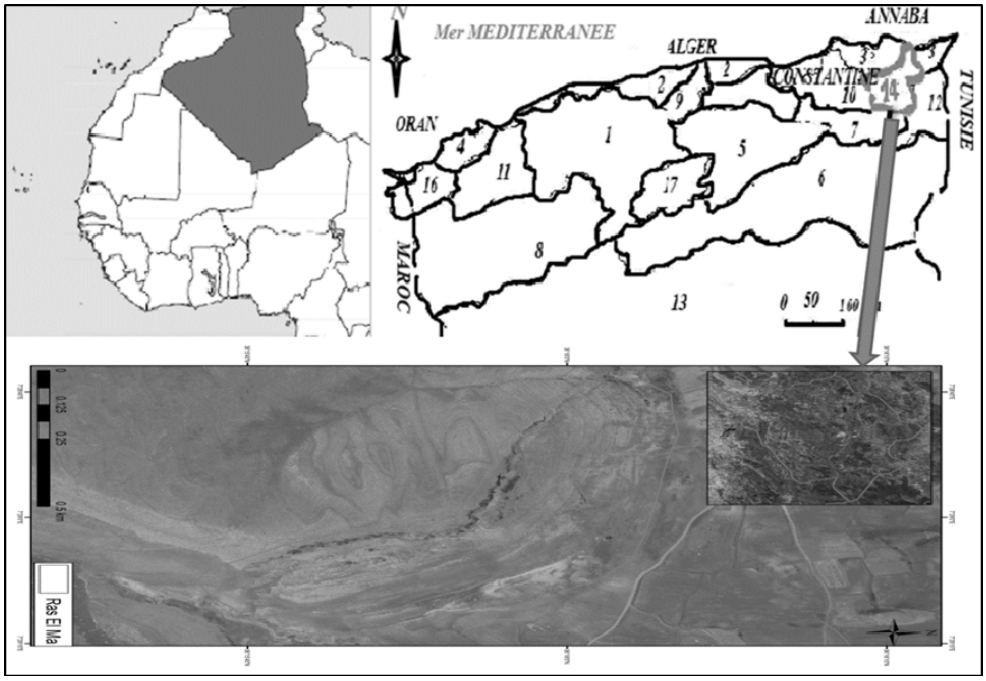

Fig 1: Geographical location of the study area.

Fig 2: General vie of Ras El Ma ravine.

2.2 Data collection

We started to visit the ravine from February to July 2015, data were collected weekly and active nests of black kite were surveyed. All nests of this raptor were marked by fixing small flag on the ground near the nest [15]. Some breeding activities were recorded: egg-laying, hatching and departure of chicks [16]. Five nests parameters were measured: internal and external diameter, nest height, elevation of the nest in ravine and distance between nests [17]. Also nest site selection and substratum used to build nests were noted. Dimensions of eggs were measured with a digital caliper to the nearest 0.01 mm or with a Pesola spring balance to the nearest 0.1 g [15]. Egg volume was estimated using Hoyt's formula (1979): V (cm^3) = (0.509 x L x B^2) / 1000; *L* and *B* are the length and breadth of eggs in mm [18]. Pellets of the black kite found on the ground near the ravine were collected, conserved in bag, air-dried, and dissected to identify types of prey [16].

3. Results

3.1 Abundance

The black kite was present in the ravine from the first week of March to last September. The maximum number of this species was noted at the first week of August (28 individuals) then the number gradually decrease until the end of breeding season (Figure 3). During this study, we have observed 7 breeding pairs of this raptors and a total of 36 nests were recorded, the maximum number of nests were found at late May and early June (10 and 11 nests respectively).

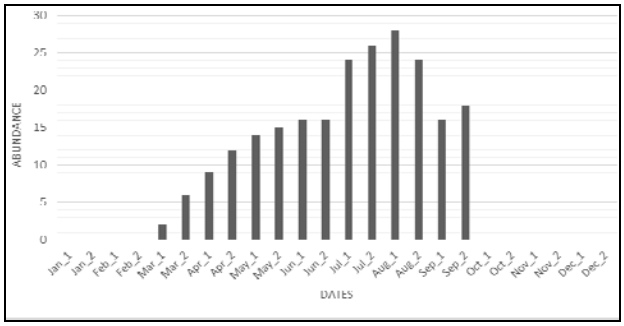

Fig 3: Abundance of Black Kite *Milvus* migrans at Ras El Ma ravine during the study period.

3.2 Breeding phenology

At Ras El Ma ravine, the breeding period was carried out from March to July, the egg-laying was started from April 9th (1st egg laying). The first hatching was noted from May 14th after 33 days of incubation. The parental investment in the nest was dived between male and female until the first chick had fledged (July 16th).

3.3 Nest characteristics

Table 1 summarized the abiotic parameters of black kite nest at Ras El Ma ravine. This raptor built its nests directly in the cliff or in the tree located in the ravine or use old nests of previous breeding season.

Table 1: Nest characteristics of Black Kite in Ras El Ma ravine.

External diameter (cm)	Internal diameter (cm)	Nest height (cm)	Elevation of nest in ravine (m)	Distance between nests (m)	Composition
55 ± 5.66 [51-68]	36 ± 8.25 [29-57]	5 ± 1.33 [3-7]	21 ± 2.74 [14-33]	11 ± 4.82 [9.8-14.7]	Inorganics substratum (35%) Plastic substratum (23%) Vegetation : - *Olea europea* (17%) - *Scolymus hispanicus* (08%) - *Innula graveolens* (08%) - *Ormenis mixta* (04%) - *Lolium rigidum* (03%) - Autres Graminées (02%)

3.4 Egg characteristics

During our study, the mean egg length of the black kite was 55 ± 2.33 mm, the mean egg breadth was 43 ± 2.11 mm, the mean egg weight was 103.66 ± 1.2 g and the mean egg volume was 51.76 ± 1.2 cm^3, also the mean clutch size was 3 eggs per nest with a maximum of 4 eggs and a minimum of 2 eggs (Table 2).

Table 2: Egg characteristics of Black Kite in Ras El Ma ravine.

Mean clutch size /range	Egg weight (g) (n= 15)	Egg length (mm) (n= 15)	Egg breadth (mm) (n=15)	Egg volume (cm^3) (n=15)
3 [2-4]	103.66 ± 1.2 [102-105]	55 ± 2.33 [52-58]	43 ± 2.11 [41-46]	51.76 ± 1.2 [44.49-62.46]

3.5 Diet

The diet of the black kite studied during the breeding season at Ras El Ma ravine was dominated by the rodent with a proportion of 46%, then fellow by birds mainly the passerine (29%), the reptilian (19%) and the amphibian with only 6% (Figure 4).

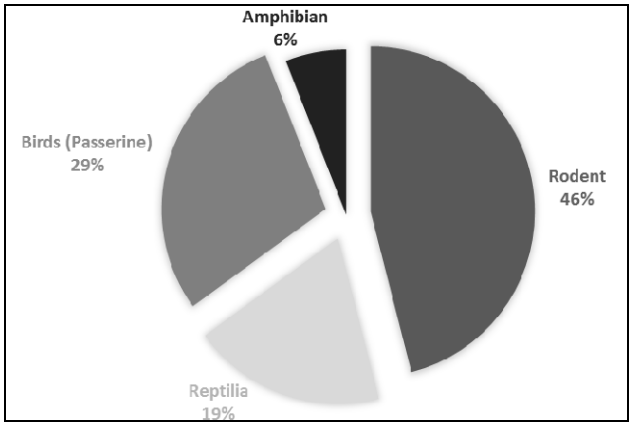

Fig 4: the diet of Black kite *Milvus* migrans at Ras El Ma ravine.

4. Discussion

This study was carried out to characterize the breeding ecology of black kite in northeast of Algeria. Guelma province is one of important area of black kite breeding in Algeria. The number of breeding pairs increased gradually per years. Geomorphology of this region dominated by ravine and dell influenced the nestling of raptors.

Laying date start early in Ras El Ma ravine (from April), the laying date in our study is longer that reported in previous study (27 days) [1]. Clutch size of black kite was 3 eggs per active nest and the 15 nests containing at least on eggs, this mean clutch size in this current study was similar to that reported in previous studies [1, 9].

The Guelma black kite built nests on cliff, tree or nests of previous years, it is differ to what is reported in other studies where the major nests of black kite were built on the tree (sweet chestnut, downy oak, common lime, Scotch pine) and only 29% on the cliff or in the canopy of the trees [1].

The rodent was the dominant prey of the diet of this raptor, these results confirm the diet of kite reported in previous study [16, 19, 20]. The raptors especially, black kite can change quality of their diet according to geographical location and area selected to build nest, in the breeding Italian pre-alp population the diet was dominated by birds and fish [1]. Many factors such as pollution and pesticides could related to low breeding success of this species. Although, there is no evidence that nestling survival was related to the kinds of their diet [16].

Fig 5: Chick of the black kite in Ras El Ma ravine.

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