Olive Groves' Avifauna in Lebanon: The Composition of Bird Species and the Importance of the Inter-Relation Olive Ecosystem and Bird Diversity

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Abstract: This study deals with the composition of the avifauna in the olive groves of the West Beqaa Valley and Rachaya, and the interrelation between birds and olive groves. The study documents the breeding of twenty-two bird species in these olive groves, as well as the existence of twenty-six breeding species in the study site coming from the neighboring habitats. In addition, twenty-five species were recorded as passage migrants and/or winter visitors. The benefits provided by olive groves to the various species of the studied birds and the services in return offered by birds to the olive trees are discussed. This is the first study in Lebanon that is dedicated to the study of olive groves and their birds. It demonstrates that the interrelation between birds and olive groves is a perfect example for the understanding of the importance of biodiversity in developing agricultural production and improving its quantity and quality.

Keywords: Avifauna, Birds, Olive groves, Pests, Biodiversity, Lebanon.

Introduction

Olive groves are the basic tree cultivation in the Mediterranean and dominate the rural landscape (Loumou and Giourga, 2003). In this man-made habitat (Figure 1: Photo of typical olive groves viewed in Rachaya), many species, including birds, have adapted to and found elements of their ecological niche in it (Rey and Gutiérrez, 1996).

In Lebanon, this habitat covers a national surface area of 58000 ha (Ministry of Agriculture [MoA], 2018), of which, the authors studied 1084 ha in the Rachaya District under the project "Assessing the Biodiversity Value of Olive Sites in Mount Hermon KBA and Identifying the Environmental Impacts of Various Agricultural Practices."

The project was managed by Environment For Life NGO (EFL), and was funded by Critical Ecosystem Partnership Fund (CEPF). Also,1121 ha in West Beqaa (Aitanit, Ain Zibdeh and Khirbet Qanafar) were studied under the project "Building the Ecologic and Socio-economic Resilience of the Shouf Mountain Landscape by Restoring and Strengthening the Socio-cultural Fabric which Sustains its Biodiversity and Cultural Values."

The project was conducted in the eastern parts by the Society for the Protection of Nature NGO (SPNL), and was funded by MAVA Foundation. The studies took place during the springs (March-May) of 2018, 2019, 2020 and the autumns (mid-August-November) of 2018 and 2019. The undertaken surveys showed that the olive groves host seventy-three bird species including breeding resident birds, breeding summer visitors, wintering and passage migrant species. The main localities mentioned in the text (Rachaya and West Beqaa) are shown in Figure 2.

Materials and Methods

The methodology used depended on the objectives of the present study which are to determine the bird species that breed, feed, and roost in olive groves, and their phenological and conservation statuses, and their frequency and abundance. Accordingly, the study area was surveyed during the springs of 2018, 2019, and 2020 with the

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Figure 1. Olive groves at Rachaya District.

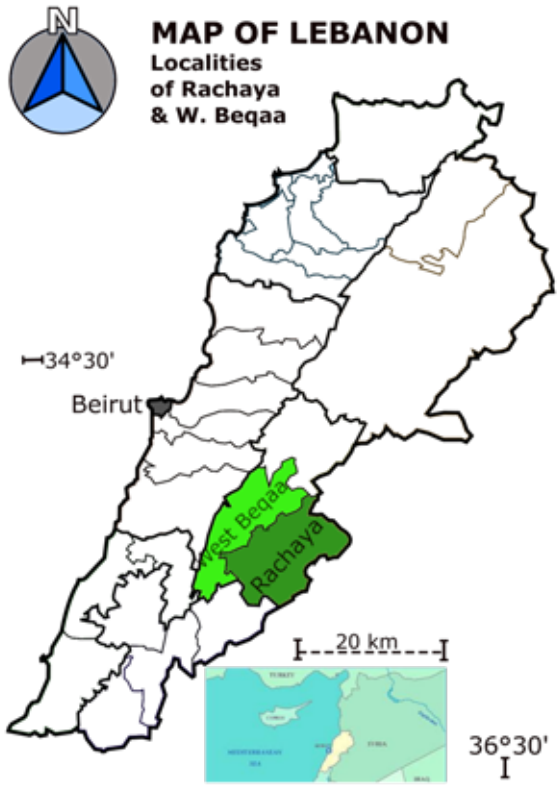

Figure 2. Location of study sites on the map of Lebanon.

Point Count Method and during the autumns of 2018 and 2019 with the Linear Transect Method, often between 08:00 and 16:00.

The Point Counts Method used is the one described by Blondel, J., Ferry, C. and Frochot, B. (1981). The spring points are randomly selected within a stratified sampling process to provide representative samples of the study area. In each point, the observer remained immobile and recorded all pairs of birds encountered within a circle of a 200-meter diameter. Twenty minutes were enough for the nesting birds to return or leave the nest to feed or bring food, as the parents cannot generally stay away from the eggs or the nestlings for more than twenty minutes. During autumn, the observer traversed with slow paces linear transects of 500 meters each with stops at intervals of 100 meters where he recorded all species and individuals seen or heard on both sides of the transects and up to 100 meters; also he recorded all food searched and eaten, when possible.

The researchers established 14 four-hectare plots representing olive groves of West Beqaa (Khirbet Qanafar, Ain Zibdeh and Aitanit) and 14 four-hectare plots at Rachaya, where one visit per month was made in each of the two sites and seven plots were studied per visit. Surveys, foraging observations, and nest searches were conducted on each plot (Point Count) during the springs and autumns mentioned above.

In addition, all shrubs, stone walls, and electric lines and poles on each plot were recorded. This study enabled the researchers to clarify the ecological interrelationships that exist in olive groves.

At the end of the study, the researchers analyzed the data collected and the details obtained from the methodologies applied in this study. Birds passing over head, without using the study area as a stopover, were all recorded but not used in the analysis of the data.

Results

The total number of bird species recorded in the olive groves in spring and autumn was seventy-three different species, whereas, the average richness per survey-plot was 4.5 species in West Beqaa and 4.34 in Rachaya with no significant difference ($P < 0.005$). Out of the seventy-three species, sixty-six are shared by both sites.

Out of the total number of species, twenty-six species are classified as resident breeding in Lebanon, but the status of some of them in olive groves may not be similar to that of the national ones (Ramadan-Jaradi, *et. al*., 2020); i.e., they were not observed breeding at the study sites. Those that were recorded as resident breeding in the olive groves belong to ten species: the Barn Owl *Tyto alba* (in open groves with ancient trees with cavities), the Tawny Owl *Strix aluco* (in ancient trees with cavities), the Eurasian Hoopoe *Upupa epops* (in ancient trees with cavities), the White-spectacled Bulbul *Pycnonotus xanthopygos* (in trees), the Graceful Prinia *Prinia gracilis* (in ground grassy or bushy understory), the Sardinian Warbler *Curruca melanocephala* (in brambles and thorny bushes between olive trees), the Common Blackbird *Turdus merula* (in trees), the Western Black Redstart *Phoenicurus (ochuros) ochruros* (in stone walls of terraces or old houses of farmers), the House Sparrow *Passer domesticus* (in houses within the olive groves, but preferably roosts in the latter, and the European Goldfinch *Carduelis carduelis* (in trees).

Twenty-five species are considered as summer breeders (migrants or non-residents that breed in Lebanon, usually after their arrival in April), and were recorded in the studied olive groves. Out of those, twelve species nest within the olive groves; they include: the European Turtle Dove *Streptopelia turtur,* the Red-backed Shrike *Lanius collurio,* the Masked Shrike *Lanius nubicus,* the Eastern Olivaceous Warbler *Iduna pallida*, the Upcher's Warbler *Hippolais languida,* the Olive-tree Warbler *Hippolais olivetorum,* the Eurasian Blackcap *Sylvia atricapilla,* the Lesser Whitethroat *Curruca curruca,* the Eastern Orphean Warbler *Curruca crassirostris,* the Common Whitethroat *Curruca communis,* the Rufous-tailed Scrub Robin *Cercotrichas galactotes,* and the Spotted Flycatcher *Muscicapa striata.*

Some of the remaining recorded species 1) may breed in shrubs, trees, or on the ground outside the olive groves (e.g. the Woodchat Shrike *Lanius senator*, the European Greenfinch *Carduelis chloris*, the Common Chaffinch *Fringilla coelebs*); generally, they are mainly those that are considered as "visitors" to the olive groves; and 2) they may be birds of passage such as the following five migratory raptor species that used the olive grove as a stopover or as a roosting site: (the Honey Buzzard *Pernis apivorus*, the Lesser Spotted Eagle *Clanga pomarine*, the Short-toed Snake Eagle *Circaetus gallicus*, the Eurasian Sparrowhawk *Accipiter nisus,* the Common Buzzard *Buteo buteo*) or such as the European Stonechat Saxicola rubicola, the Collared Flycatcher (*Ficedula albicollis*, and the Song Thrush *Turdus philomelos*).

One migratory pigeon (the Common Woodpigeon *Columba palumbus*) has participated in the late autumn with the summer breeding Turtle Dove *Streptopelia turtur* and the resident breeding Rock Pigeon *Columba oenas* in swallowing olive fruits. Other birds that belong to the warbler group, particularly of the family Sylviidae, were recorded pecking olive fruits, but sometimes swallowing small ones that fit their gape width as in the case of shrubby wild olive trees (Rey and Gutiérrez, 1996) or in ancient olive trees (Saleem Hamadeh, pers. comm.).

Two breeding species, the Turtle Dove (Figure 3) and the Syrian Serin (Figure 4) are considered Vulnerable following the

IUCN Red List (BirdLife Datazone, 2020 a & b).

During the surveys the researchers recorded all the species that were seen feeding on olive fruits on the trees or on the ground, and if they were swallowing the whole fruits or pecking the pulps only. Four species of the family Columbidae and six species of the family Turdidae (the Ring Ouzel *Turdus torquatus,* the Common Blackbird *Turdus merula,* the Fieldfare *Turdus pilaris,* the Redwing *Turdus iliacus,* and the Song Thrush *Turdus philomelos*) were observed swallowing whole olive fruits, possibly to avoid the bitter taste of olives. Twelve species of warblers were seen swallowing the small fruits of olive; otherwise, they were pecking pieces of the pulp of large fruits. Finally, in this study, ten species were found pecking pieces of olive fruits but not swallowing even the small ones.

These include: the Rufous-tailed Scrub Robin *Cercotrichas galactotes,* the European Robin *Erithacus rubecula,* the European Greenfinch *Chloris chloris* and the European Goldfinch *Carduelis carduelis.* However, all the species eating olives have shown preference to ripened fruits or to the infested ones by pest insects.

Figure 3. Turtle Dove at West Beqaa

Figure 4. Syrian Serin at Rachaya

Discussion

The persistence of olive groves in West Beqaa and Rachaya, as well as in other areas in Lebanon, is threatened by increased human agglomeration, abandonment of olive groves, fuel wood harvest, range management, diseases caused by insects, fungi and bacteria, and by the slow regeneration of trees. Olive groves are extremely valuable to wildlife not only because of the high food value of olive fruits but also because they support an abundant insect fauna. These insects support large breeding bird populations, and provide an important food source to bird migrating between wintering and breeding grounds.

The recording of twenty-two breeding bird species in an apparently monotonous and homogeneous habitat of olive trees, demonstrates the importance of this landscape. However, this richness is supported by other aspects of the olive grove landscape, i.e., the many small habitats found under the canopy of the trees. The presence of shrubs, scrubs, hedges, grass, water courses, pools, and the proximity of the groves to other groves, chiefly of fleshy fruits (plum, pears, beach, cherry, etc.) or wild maquis, garrigues and batha, have all contributed to an increased diversity of the elements of the ecological niches of the various bird species in the olive groves.

Close numbers of species were observed in olive groves in Greece (Poirazidis *et al*., 2011). In addition, the traditional management of the olive groves has also contributed to the high avian diverse richness, where the light grazing, by sheep or goats, of the herbaceous layer under the olive trees, as well as the presence of wall stones, and the ancient trees full of cavities, have also helped increase the biodiversity of the olive groves.

Historically, farmers at the time of olive fruit

collection used to leave some olive fruits on the trees for birds to eat during winter times.

Despite the fact that in the near past, farmers used to consider *Turdidae* spp. as pest birds to olive trees, it is now obvious to all that the *Turdidae* and other birds benefit the trees and offer services to them and vice versa. Bigler, *et al.* (1986) indicated that the olive fruits eaten by the birds mostly contained larvae, which indicates that birds do not have a negative impact on production, and that birds consumed 65–71% of the pupae in soil, and ants attacked most of the rest (Pienkowski and Beaufoy, 2000). In another study, Cavalloro and Delrio, 1975 said that birds were one of several important predators of the Olive Fruit Fly pupae along with ants, beetles and centipedes.

In the current study, the tiny Olive Fruit Fly *Bactrocera olea* is found to be the most harmful pest to olive trees and fruits in Lebanon (MoA, 2019). The female lays its eggs in the olive fruits and the maggots (larvae) stay in the fruits during the summer causing the early fall down of the fruits on the ground, and then the larvae pass the winter in the soil (MoA, 2019). The fallen olive fruits are premature and small in size, which makes them swallowable with the larvae not only by the *Turdidae* and *Columbidae* but also by the *Sylviidae* and most of the other species recorded in the study.

The larvae that leave the olive fruit make the pupae in the soil, but the ground feeding birds help in finding and devouring them. The flying Olive Fruit Flies are an appropriate prey to flycatchers, swallows and swifts, especially that the appearance of these birds is synchronized with that of pest insects of olive trees. The second harmful pest is the tiny Olive Moth *Prays olea* that attacks olive fruits before the stone is hardened and causes them to prematurely fall from the tree after the small larvae emerge to go and attack the leaves.

Here again the small insectivorous birds (such as the Graceful Prinia, the Black Redstart, the Willow Warbler, and the Olivaceous Warbler) lurk to devour the moth and its larvae, and to eat the small fruits that fell to the ground. On several occasions, the researchers observed the House Sparrow, which usually nests in premises but roosts in the olive grove, feeding in the early morning on the wet and immobilized moths on the branches.

The third harmful pest is the Olive Tree Borer that may kill a young tree with one larva (MoA 2019). Its large larvae and adults are attractive to many bird species in this study area, ranging from kestrels, to woodpeckers, bulbuls, shrikes and warblers. The fourth harmful pest is the Olive Bark Midge *Resseliella oleisuga,* and its larvae feed under the bark, getting to cut off the sap flow and the branches dried (Alvarado, *et al.,* 2006).

However, most of small insectivorous birds and birds eating olive fruits can significantly reduce the population of this pest (Paloma Budia, 2012). Finally, it is worth mentioning that another role for the birds that swallow the whole olive fruit is that they contribute to the dispersal of the seeds by defecation elsewhere in the wild.

Unfortunately, there are still olive farmers who are not aware of the benefits which birds provide to improve the quality and quantity of their yield by eliminating insect pests. They still lease their farms to hunters (targeting Thrushes and other species) in every hunting season. If they knew the value of birds, they would prevent hunting on their lands.

The researchers hope that the results of this study, as well as other wildlife studies currently being conducted in olive groves will contribute to the wise management and understanding of agriculture heritages and their associated wildlife populations.

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