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Nesting Ecology of Mourning Doves in Fruit Orchards in North-Central Washington

Abstract

Nesting ecology of Mourning Doves (*Zenaidura macroura*) was studied in three orchard types which received differing levels of human management and contained trees of differing fruit type, age, and growth-form. The orchard receiving only moderate levels of human management had the highest density of nesting doves. Pruned, apple-standard trees between 20 and 27 years old were the preferred nest trees, presumably because of the abundance of horizontal limbs for nest sites. The peaks of nesting and nesting success occurred during July. Nesting success was highest in the cultured orchard, much lower in the semi-cultured orchard, and zero in the feral orchards, with these differences attributed mainly to the differing levels of human activity. Nesting success was highest in the older, apple-standard trees, and lowest in the non-apple fruit trees and younger, apple-dwarf trees. The average number of young produced per pair varied from none to 3.1.

Introduction

Harris *et al.* (1963) and Caldwell (1964), among others, have noted that Mourning Doves (*Zenaidura macroura*) show nest site preferences for certain tree species. Oliver (1966) and Zeigler (1977) suggested that fruit type, age, and growth-form of fruit trees are important factors in dove nest site selection in orchards. To our knowledge, no one has studied Mourning Dove nesting ecology in orchards receiving different levels of management. This paper compares the nesting ecology of Mourning Doves in three markedly different orchard types (cultured, semi-cultured, and feral) and examines

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differences in nesting densities and nesting success with fruit type, age, and tree growth-form of fruit trees.

Study Area and Methods

Field work was conducted in four orchards located within 14 km of each other along Rufus Woods Lake, a 72-km stretch of the Columbia River between Chief Joseph and Grand Coulee dams in Okanogan and Douglas counties. The region is largely uncultivated land, typical of the arid shrub-steppe regions of eastern Washington and is used for cattle grazing with small areas in orchards, grain, and hay. Erickson *et al.* (1977) have presented a detailed physiographic, vegetative, and faunal description of the area.

The four orchards chosen for study differed in size, fruit type, age, and tree growth-form (Table 1), as well as in the amount of human management administered. Tree growth-form refers to tree shape and was either "standard" or "dwarf." The cultured orchard (Chief Joseph) was a commercial orchard which was mowed, pruned, treated with pesticides, irrigated (ground sprinklers and rill irrigation), and harvested. The semi-cultured orchard (Thalhimer's) received little attention other than irrigation (ground sprinklers) and occasional pruning. The feral orchards (Mulberry and Goldmine homestead orchards) had received no human treatment for 40 to 50 years.

Each orchard was checked a minimum of once per week for Mourning Dove nesting activity in 1975: Chief Joseph Orchard (CJO) was checked 23 times between 6 April and 29 August, Thalhimer's Orchard (TO) was checked 18 times between 5 April and 11 August, and Mulberry (MHO) and Goldmine (GHO) homestead orchards were both visited 30 times between 5 April and 26 July. Because of the small size of TO and the two feral orchards (Table 1), all trees were checked during each visit. The size of CJO made checking every tree prohibitive; therefore, a predetermined number of randomly selected trees were checked (Table 1).

Nests were examined with a car mirror attached to a long pole and were checked until their fates were determined. Nesting terminology is as follows: a nesting attempt was determined by the presence of eggs or adults on a nest; a successful nesting attempt was one that fledged at least one young; a destroyed nest was one which was no longer present during a later visit or one evidencing mortality of eggs or young. The approximate nesting population of each stand was determined by using the largest number of active nests located in a single day (McClure 1942). Lowe (1956) suggested that this method probably underestimates the actual nesting population as it is not likely that all pairs will have a nest active at any one time.

Results and Discussion

Orchard and Nest Tree Utilization

Overall nesting density was highest in TO, indicating that the semi-cultured orchard type offered the most attractive nesting situation for doves (Table 2). Fichter (1959) in Idaho, and Zeigler (1977) in Washington, suggested that Mourning Dove nesting density was the result of both nesting cover and surrounding habitat requirements such as food and water. TO and CJO were equidistant from abundant water (i.e. Columbia River) and food (i.e. grain fields) yet TO had a much higher nesting density than CJO in fruit tree types of similar age and growth form (Table 2). One possible explanation for this difference was the different levels of human activity in the two orchards.

TABLE 1. Tree characteristics of three orchard types sampled for Mourning Dove production in 1975.

Fruit type and growth-form	Date stand planted	Size of stand (ha)	Average height of stand (m)	Average DBH of stand (cm)	Number of trees sampled	Percent of total stand sampled
Cultured Orchard						
(Chief Joseph)						
apple, standard	1955	8.7	5.5	25.4	859	27.5
apple, standard	1960	2.4	5.3	25.4	205	23.2
apple, dwarf	1960	2.7	4.6	25.4	302	21.8
apple, dwarf	1970	2.5	3.0	10.2	357	21.2
apple, dwarf	1971	0.5	3.0	10.2	146	42.6
apple, dwarf	1972	1.2	2.1	5.1	146	18.6
cherry, standard	1965	0.8	6.0	17.8	222	66.7
pear, standard	1965	1.2	4.8	15.2	269	30.9
Semi-cultured Orchard						
(Thalhimer)						
apple, standard	1948	0.6	5.4	25.4	76	100.0
prune, standard	1948	0.1	no data	no data	32	100.0
cherry, standard	1948	0.04	no data	no data	5	100.0
pear, standard	1948	0.04	no data	no data	14	100.0
Feral Orchards						
(Mulberry Homestead)						
apple, standard	1910	0.1	7.8	15.2	40	100.0
mulberry, standard	1910	0.1	11.1	33.0	41	100.0
(Goldmine Homestead)						
apple, standard	1895	0.2	7.2	22.9	21	100.0

TABLE 2. Tree availability and usage by Mourning Doves in three orchard types, 1975.

Fruit type, growth-form, and age of tree	Percent of total trees in orchards	Ranking of fruit tree abundance	Number of nesting attempts	Number of nesting attempts per 100 trees checked	Ranking of dove usage
Cultured Orchard					
(Chief Joseph)					
apple, standard, 20	32.4	1	76	8.8	2
apple, standard, 15	9.2	4	12	5.9	3
apple, dwarf, 15	14.4	3	10	3.0	5
apple, dwarf, 5	17.5	2	3	0.8	7
apple, dwarf, 4	3.6	7	1	0.7	8
apple, dwarf, 3	8.1	6	0	0.0	9
cherry, standard, 10	3.5	8	3	1.4	6
pear, standard, 10	9.0	5	2	0.7	8
Total or average	97.7		107	4.3	
Semi-cultured Orchard					
(Thalhimer)					
apple, standard, 27	0.8	9	14	18.4	1
prune, standard, 27	0.3	12	0	0.0	9
cherry, standard, 27	0.1	13	0	0.0	9
pear, standard, 27	0.1	13	0	0.0	9
Total or average	1.3		14	11.0	
Feral Orchards					
(Mulberry and Goldmine)					
apple, standard, 65-80	0.6	10	2	3.3	4
mulberry, standard, 65	0.4	11	0	0.0	9
Total or average	1.0		2	2.0	
Grand total or average	100.0		123	4.5	

CJO was under intensive and continual human management whereas TO was attended sporadically during the nesting season. Other than our visits, the feral orchards were never visited by humans, yet, they had virtually no nesting doves. Although both feral orchards were close to water, they were surrounded by extensive shrub-steppe which provides a less-rich food source than do grain fields (Zeigler 1977). Two alternative explanations for the lower nesting density in the feral orchards could be interspecific nest-site competition (which appeared low in CJO and TO where few other bird species nested), and the reduced suitability as nest sites of the unpruned, and therefore, extremely dense canopied, trees (see below).

The highest Mourning Dove nesting densities occurred in 20- and 27-year-old apple-standard trees (Table 2). Lowest nesting densities occurred in non-apple fruit trees such as cherry, pear, mulberry, and prune trees, as well as in apple-dwarf trees less than 5 years old. There was a nonsignificant relationship between ranking of fruit tree abundance and ranking of fruit tree usage by nesting doves (Daniels' correlation, $D = 198$, $P > 0.4$), indicating that doves showed nest tree preferences.

Harris *et al.* (1963) found that doves preferred nest sites on horizontal limbs that offered an unobstructed flight path. Coon *et al.* (1981) demonstrated that the probability of a nest succeeding was affected by its structural stability which in turn was influenced by its placement. Nests placed on horizontal limbs are probably more secure than those placed on sloping limbs. Results from nesting studies in eastern Washington orchards (summarized in Zeigler 1977) indicated that highest nesting densities occurred in pruned 25-30-year-old apple-standard trees which had large, flat horizontal limbs which are preferred as nest sites. Non-apple fruit trees and apple-dwarf trees less than 15 years old had the lowest nesting densities. These findings agree closely with our results. Non-apple fruit trees and young apple-dwarf trees lacked horizontal limbs. Oliver (1966) and Zeigler (1977) found $2\frac{1}{2}$ times as many nests in 19-year-old apple-standard trees as in 14-year-old apple-dwarf trees, but equal nesting densities were found when the trees were 30 and 25 years old respectively, at which time the apple-dwarf trees had horizontal limbs. The unpruned 65-80-year-old apple-standard trees at GHO and MHO lacked horizontal limbs and unobstructed flight paths, which might partially explain the low nesting densities.

Nesting Season

Earliest and latest dates of active nests in CJO were 13 April and 29 August, respectively. A second nesting attempt was not located in CJO until the first week in May. Comparable dates for TO were 9 May and 27 July whereas earliest dates in the two feral orchards were 24 May and 22 June. Length of nesting season based on presence of active nests was 139 days in CJO and 80 days in TO. Nesting activity was high from May through August, peaking in July, during which 38 percent of all nests were found. The inclusive dates of nesting activity are similar to those reported in four Idaho orchards by Fichter (1959) who also observed a July peak.

Nesting Success

Nesting success increased from April through July and was correlated with the increase in number nesting attempts (Table 3). The relationship between number of nests and nesting success was significant ($\chi^2 = 8.8$, $df = 4$, $P < 0.05$).

Fichter (1959) observed that the number of young fledged per nesting attempt and

TABLE 3. Monthly distribution of Mourning Dove nesting attempts in apple trees for all orchards combined, 1975.

Month	Percent and number of total tests	Percent and number of nesting attempts successful
April	0.8 (1)	0.0 (0)
May	19.5 (24)	8.3 (2)
June	22.8 (28)	50.0 (14)
July	38.2 (47)	60.9 (28)
August	18.7 (23)	21.7 (5)
Total or average	100.0 (123)	40.1 (49)

the percentage of nesting attempts successful are useful parameters in interpreting Mourning Dove nesting studies. Fichter (*Ibid.*) summarized several studies and found that successful nesting attempts ranged from 47 to 71 percent, and that the number of young fledged per nesting attempt ranged from 0.85 to 1.38. In our study, differences between orchard types in percentage of nesting attempts successful ranged from zero to 67 percent and varied significantly with fruit type and age of tree ($\chi^2 = 12.5$, $df = 8$, $P < 0.05$) (Table 4). The percentage of nesting attempts successful was highest in the older apple-standard trees, and all nests were unsuccessful in the feral orchards and in non-apple fruit trees in all of the three orchard types. The average number of young fledged, per nesting attempt, ranged from zero to 1.3 in the various orchards and showed the same patterns as the percentage of nesting attempts successful (Table 4).

Of 107 nesting attempts in CJO, 33 (31 percent) failed from either weather or predation during the incubation stage and only one failed during the nestling stage. Of 196 eggs in all nests, 56 (29 percent) were destroyed by weather or predation, whereas, only three of 99 young (3 percent) disappeared. In TO ten of 14 nests (71 percent) were destroyed by either weather or predation during the incubation stage and none were lost during the nestling stage. Sixteen of 21 eggs (76 percent) were destroyed and no young were lost. Both nesting attempts in the feral orchards failed during the incubation stage. The percentage of eggs lost in CJO falls within the range of 22 to 46 percent summarized by Fichter (1959) but the percentage of eggs lost in TO is higher than previously reported. The percentage of nestlings lost in both CJO and TO is less than the range of 5 to 22 percent summarized by Fichter (*Ibid.*).

A large difference between the percentage of destroyed nesting attempts in CJO and TO (31 versus 71 percent) cannot be explained entirely by differences in weather or numbers of potential predators, as both orchards were similarly situated and had approximately equal numbers of domestic cats and nesting Black-billed Magpies (*Pica pica*) (Erickson *et al.* 1977). Why then should dove nests that occur in similar fruit tree types and orchards that are approximately similar in predator populations and other environmental variables such as weather, food, and water, differ markedly in both nesting densities and nesting success rates (Table 4)? We suggest that the differences in nesting densities and nesting success among similar fruit tree types in CJO and TO were largely the result of differences in levels of human activity. High and continual human activity in CJO may have disrupted nesting activities resulting in a lower nesting density and likewise disrupted potential predator activities resulting in higher nesting success. TO experienced only intermittent human activity, allowing less disruption of nesting and predator activity, which may explain the higher nesting density and lower

TABLE 4. Productivity of Mourning Doves in three orchard types, 1975

Fruit type, growth-form, and age of tree	Nesting pairs per 100 trees checked ^a	Nesting attempts per pair ^b	Percent nesting attempts successful	Eggs per nesting attempt	Percent eggs hatched	Percent young fledged	Young fledged per nesting attempt
Cultured Orchard (Chief Joseph)							
apple, standard, 20	3.3	2.6	47.4	1.8	53.6	86.7	0.9
apple, standard, 15	2.4	2.4	66.7	1.9	69.6	100.0	1.3
apple, dwarf, 15	1.0	3.3	30.0	1.8	33.3	100.0	0.6
apple, dwarf, 5	0.3	3.0	33.3	2.0	33.3	100.0	0.7
apple, dwarf, 4	0.7	1.0	0.0	2.0	0.0	0.0	0.0
apple, dwarf, 3	0.0	—	—	—	—	—	—
cherry, standard, 10	0.4	3.0	0.0	2.0	0.0	0.0	0.0
pear, standard, 10	0.7	1.0	0.0	0.0	0.0	0.0	0.0
Sample average	1.7	2.5	44.9	1.8	50.5	89.9	0.9
Semi-cultured Orchard (Thalheimer)							
apple, standard, 27	6.6	2.8	14.3	1.5	19.0	100.0	0.3
prune, standard, 27	0.0	—	—	—	—	—	—
cherry, standard, 27	0.0	—	—	—	—	—	—
pear, standard, 10	0.0	—	—	—	—	—	—
Sample average	3.9	2.8	14.3	1.5	19.0	100.0	0.3
Feral Orchards (Mulberry and Goldmine)							
apple, standard, 65-80	3.3	1.0	0.0	0.5	0.0	0.0	0.0
mulberry, standard, 65	0.0	—	—	—	—	—	—
Sample average	2.0	1.0	0.0	0.5	0.0	0.0	0.0
Grand average	1.8	2.5	40.7	1.8	47.2	90.3	0.8

^aBased on largest number of active nests located in a single day.

^bTotal number of nesting attempts divided by the largest number of active nests located in a single day.

nesting success. Osborne and Osborne (1980) found that urban Blackbirds (*Turdus merula*) nesting near human activity had higher desertion rates and lower predation levels than nests farther from human activity. They implied that the frequency, intensity, and predictability of human activity influenced nesting success by altering desertion rates and predation levels.

Productivity

Average number of nesting attempts per pair of doves ranged from 1.0 to 3.3 in the three orchard types (Table 4).

Estimates from our study indicate that Mourning Doves produced an average between none and 3.1 young per pair depending on orchard type and fruit tree type. Harris *et al.* (1963) discussed the number of young per pair that should be produced by nesting doves to maintain a stable population and presented estimates between 3.2 and 4.6 young per pair, depending on annual mortality rates. Fichter (1959) summarized published findings and reported that the average number of young fledged per pair of doves ranged from 2.0 to 6.7. Productivity from the orchards we studied for one nesting season was near the low end of the published range.

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