

THE GOLDFINCH DATING GAME

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ABSTRACT: The American Goldfinch (*Carduelis tristis*) breeds in late summer in northern Indiana. Birds are seen in courtship during July but nest construction and egg-laying begin the last part of July, peaking in the first week of August. We observed goldfinches at thistle feeders on the campus of Saint Mary's College during July and August. Most individuals were uniquely banded with colored vinyl leg bands, and known breeding pairs were documented at nests. At the feeders, we recorded males and females as "dating" if they were seen arriving together, eating together on a feeder, or leaving together. A summary of these records shows that, although there were several individual exceptions, females were generally accompanied by many males besides their mates, even during egg-laying periods. These opportunities for extrapair copulations suggest that paternity may be more uncertain than one might suppose in this monogamous species. For the breeding pairs of this study, male age was not significant in determining reproductive success.

INTRODUCTION

The American Goldfinch (*Carduelis tristis*) is a small seed-eating passerine that begins pair formation in June and breeds in July or August. Goldfinches prefer orchard-like habitats (Middleton, 1979), and are currently considered to be monogamous (Middleton, 1988). Ford (1983) defines a species as monogamous if the rate of polygamy does not regularly exceed 20%. There have been reports of polyandry by females with prior breeding experience (Middleton, 1979, 1988; Skagen, 1987).

Male goldfinches guard their territories during nest building and then feed the female while she incubates eggs (Tyler, 1968). Because female goldfinches stay on their nests up to 95% of the time during incubation this represents a large investment of time and energy for the male (Carey, 1980). If the male is committed to considerable parental investment then it is to his advantage to protect his paternity, i.e., to practice mate guarding. According to Birkhead (1979), mate guarding occurs when the male remains close to a mate and actively prevents approach by other males during the time when copulations might result in fertilization of eggs. We studied the behaviors of goldfinches during the breeding season in order to document: (A) frequency of feeder visits, (B) mate guarding, and (C) effect of male age on breeding activities.

METHODS

Birds observed in this study were from a breeding population adjacent to Saint Mary's College (St. Joseph County, Indiana). Individuals were trapped in mist nets and banded to allow individual identification. One leg carried the standard U. S. Fish and Wildlife aluminum band while the other leg had colored vinyl bands purchased from A. C. Hughes, Middlesex, England. Single color bands included blue (Bl), yellow (Y), red (R), white (W), green (G), black (Bk), orange (O), pink (Pi), light blue (L), and purple (Pu). Split bands (with two colors) were also used. These were orange-yellow (O-Y), maroon-yellow (M-Y), red-white (R-W), and blue-white (Bl-W).

Observations were made in a rock garden at Saint Mary's College, located 200 meters west of the breeding area. The garden had two parts: a sunken flower bed surrounding a circular stream that flows into a small pond, and at ground level, a cement patio where two thistle feeders were hung 1.5 meters above ground. We used a spotting scope and field glasses to identify birds by age, sex, and band combination. "Dating" pairs were identified using one or more of the following criteria: a male and female arriving at the same time, leaving together, or on the feeder at the same time.

We visited the nests regularly during the breeding season to document the condition of nests during building and the identities of nesting pairs. The condition and number of eggs or young were recorded on each visit which allowed incubation dates to be known or extrapolated.

Age of males was determined by difference in plumage. First year breeding season birds have drab-olivaceous lesser wing coverts and white patches on the bases of the primaries. More mature males have bright yellow lesser wing coverts and usually have no white markings on their dark black primaries (Middleton, 1974). Male goldfinches do not lose their first basic plumage until their first post-nuptial molt; therefore, they do not obtain adult plumage until after their first breeding season. Males in their second year were labeled SY (second year) and males which had acquired adult plumage were labeled ASY (after second year). Females were not differentiated by age since plumage of females does not differ enough for field identification with age.

RESULTS

The "dating" record indicates all the known breeding females and the dates they were seen accompanied by males. Females were more frequently observed at feeders with ASY males than with SY males. Many different males were seen with each female. RG/S was seen with her mate the most (eight times) while other females were only seen with their mates once. Some females were never seen with their mates (Table 1).

Table 2 summarizes observations at the feeder and indicates the incubation period for each female. Female goldfinches were seen less frequently than males, especially during their incubation periods. Males S/RG and RBk/S, and their mates were not seen at all during the incubation period while RO/S and S/OY-O were seen more often than other males. The numbers represent the different times that each bird was seen during that day. These data also indicate that ASY males begin mating one week earlier (average July 29) than do SY males (average August 5).

The individual variation of feeder visits and breeding success can be seen in Table 3. There were different strategies displayed. ASY male LR-W/S was seen the most with his mate, which never came to the feeder during incubation, but this pair was not successful in fledging young. On the other hand, female RW/S was seen at the feeders twice during incubation and successfully fledged four young. There was no significant difference (the Mann-Whitney probability of equal rank is 0.87) in the number of young fledged by the ASY males (average 2.5) compared with the SY males (average 2.75).

DISCUSSION

Because of the reported tendency for female goldfinches to stay on the nest (Tyler, 1968) we expected females to be absent from the feeders during the incubation period. While the data in Table 2 are consistent with this expectation, several females (RG/S, S/OG, S/R-WR-W, and RW/S) were seen at the feeders during the incubation period.

Table 1. Dates that male goldfinches accompanied individual female goldfinches.

Female ID	Male ID	Age	Dates seen together
WL/S*	<i>L/S*</i>	ASY	6/29
	LR-W/S	ASY	8/24
RG/S*	S/LY-O	ASY	6/30
	<i>LR-W/S*</i>	ASY	7/3, 7/18, 7/25, 7/26, 7/27, 7/28, 8/4,8/9
	S/WO	ASY	7/3
RL/S*	GG/S*	SY	7/3, 7/17
	LR-W/S*	ASY	7/3, 7/7, 8/26
	S/BkY-O	SY	7/7, 8/26
	BIG/S	ASY	7/20, 8/11
	-/-	SY	8/4
	BI-WR/S	SY	8/9
	RO/S*	ASY	8/24
	M-YM-Y/S	ASY	8/25, 8/26
	S/LY-O	SY	8/26
	OR/S	ASY	8/26
	S/BIY*	<i>S/OBI*</i>	ASY
-/-		SY	7/14
GG/S*	S/BIW	SY	8/9
	<i>S/BkW*</i>	ASY	7/16
S/R Y*	S/BIW	SY	8/26
	-/-	SY	7/3, 7/10
	S/RBk	ASY	7/9
	LR-W/S*	ASY	7/10
	S/YW	ASY	7/10
	RO/S*	ASY	7/17
	R-WBI/S*	SY	7/18
YR/S*	S/GY-O	SY	7/14
	S/R-WR-W*	ASY	8/4
	<i>RO/S*</i>	ASY	8/8
WBk/S*	S/WO	ASY	7/16, 7/17, 7/25
	WR-W/S*	SY	7/18
	R-WBI/S*	SY	8/8
	RBk/S	ASY	8/9
S/PiBk*	S/LBk*	ASY	7/16
S/OG*	S/BIW	SY	7/16, 8/9
	<i>S/R-WR-W*</i>	ASY	8/9
S/R-WR-W*	<i>L/S*</i>	ASY	8/24
	<i>GG/S*</i>	SY	8/24, 8/25
	M-YM-Y/S	ASY	8/24, 8/25
	OBK/S	ASY	8/27
W/WS*	-/-	SY	8/24
	S/BIW	SY	8/24
	<i>L/S*</i>	ASY	8/24
	RBk/S*	ASY	8/26

-/- unbanded

* known breeder; documented mate for that female is italicized

Table 2. Incubation periods of breeding pairs (values are number of observations at feeders)

Bird ID*	Date (J = July; A = August)																										
	14J	16J	17J	18J	19J	20J	21J	24J	25J	26J	27J	28J	29J	31J	1A	2A	4A	7A	8A	9A	10A	11A	18A	22A	23A	24A	
RG/S	1			1																							
LR-W/S	2	1	1	1			1	1	1	1	1	1	1	1	1	1	1	1	2	3	1	1	2			2	
S/BLY	1						1																				
S/OBL		1	1	2	1	1	1	1	1	1	3	3												3	1	1	1
W/WS																											
S/RG																											
WL/S																											1
L/S																											1
S/OG	2	1	1																								
S/R-WR-W							1																				
YR/S	1			1																							
RO/S		1	1	3			1	2																			2
GG/S																											
S/BKW		1		2																							
S/PiBK																											
RBK/S		1																									2
S/R-WR-W			1	1			1																				2
GG/S**	1	1	1	1																							1
RW/S																											
S/OY-O**																											
S/BKY																											
S/OO-Y**																											
S/RY		1	1	1																							
WR-W/S**	1	1	1	1																							1

* mated pairs: female ID above, male ID below
 ** SY male

Table 3. Reproductive strategy evaluation.

Bird ID		# of young fledged	# of dates seen together	# times female seen during incubation	# of times male seen during incubation
male	female				
L/S	WL/S	5	1	0	6
S/R-WR-W	S/OG	0	1	2	5
RO/S	YR/S	0	1	0	7
LR-W/S	RG/S	0	8	1	3
S/BkW	GG/S	4	1	0	2
RBk/S	S/PiBk	4	0	0	0
S/OBI	S/BIY	4	3	0	3
S/RG	W/WS	2+	0	0	0
GG/S*	S/R-WR-W	5	2	1	10
S/OY-O*	RW/S	4	0	2	4
S/OO-Y*	S/BkY	2	0	0	1
WR-W/S*	S/R/Y	0	0	0	1

*SY male

This may indicate they needed more food than their mates were providing, or it may have been the result of different reproductive strategies.

These data do not support the hypothesis that mate guarding was occurring. The dating record indicates that the females did not feed exclusively with their mates. Only three of twelve pairs were seen together more than once and three females, S/R/Y, S/PiBk, and W/WS, were never seen with their mates, suggesting a lack of mate guarding. This would seem to have allowed extrapair copulations to occur. No extrapair copulations were observed, but it was feasible for a male to have the opportunity for an extrapair copulation by frequenting the feeder without the female.

Carey (1980) indicated that incubation changed the amount of time and energy the adults spent in other activities. For each mated pair, males were observed more frequently than females at the feeder during the incubation period. This is consistent with the observation (Tyler, 1968) that males feed the female while she is on the nest (Table 2). Table 2 indicates that males L/S, S/R-WR-W, RO/S, LR-W/S, GG/S, S/OY-O, and S/OO-Y visited the feeders more during this time than other males. This may reflect their parental investment strategy. There was also little difference in this with regard to male age since GG/S, S/OY-O, and S/OO-Y were younger, SY, males. Our finding that ASY males mated earlier than SY males supports the earlier evidence (Middleton, 1978) that ASY males establish territories and begin mating earlier than SY males. This may also reflect a different reproductive strategy for the SY males. The SY males may choose to delay reproduction to reduce competition with ASY males for territories.

SUMMARY

Females were present less frequently at the feeders than males and were rarely seen at the feeders during their incubation periods. In general, older (ASY) males began breeding earlier. For the breeding pairs of this study, male age was not significant in determining reproductive success. Male goldfinches did not exhibit mate guarding as would be expected of a monogamous species. There was considerable variation among individual birds regarding their social behavior during the breeding season. This study suggests that goldfinches have diverse dating behavior which has little influence on

reproductive success. There may be trade offs in costs and benefits which produce more than one successful strategy.

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