

# A CASE OF BIGAMY IN THE FLORIDA SCRUB JAY

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MONOGAMOUS pair bonds, which typify the family Corvidae (Landsborough-Thomson, Ed., 1964, A new dictionary of birds, New York, McGraw-Hill), also characterize the Florida Scrub Jay, *Aphelocoma c. coerulescens* (Woolfenden 1973, Living Bird 12: 25-49). From 1969 through 1974, for an accumulated 149 seasonal breedings, I studied 114 jays organized into 64 different reproductive units, and all but one were monogamous. The lone exception was a case of bigamy in which simultaneous pair bonds existed between one male and two females. As almost all Scrub Jays inhabiting the 400-ha study tract were color-ringed, regular monogamy seems substantiated at least for this population.

Occasional polygyny is recorded for numerous species of birds that usually are monogamous, but in only a few instances are the causes or effects known. Welty (1962, The life of birds, Philadelphia, W. B. Saunders) and Landsborough-Thomson (op. cit.) cite several examples. For the individuals involved in the one case of bigamy in Florida Scrub Jays, many facts are known, some of which suggest the predisposing circumstances and the factors that operate to render bigamy rare.

## METHODS

Tables 1-3 present partial histories of the Scrub Jays inhabiting four territories, 6, 6A, 7, and 8. All individuals mentioned in these tables were seen at least once each month during all the years listed or until they disappeared. Once missed they never were seen again. With some effort beyond that required to census older birds, young fledglings also can be found. As this was done for all the fledglings mentioned herein, the statements concerning estimated times of death are considered accurate. In the tables a dagger sign identifies all jays that were considered dead prior to the ensuing breeding season. The color ringing schemes used on the jays, including the band combinations unique to various age classes, are described in Woolfenden (1975, Auk 92: 1-15). Fig. 1 charts the boundaries of six territories during the years 1971-73, including the four discussed in the tables.

## OBSERVATIONS

The jay most involved with the case of bigamy was -PidGS♀. She hatched in territory 7 in 1970, and helped her father and stepmother in 1971 and 1972. In May 1972 she moved to adjacent territory 6-6A, where she was courted by two recently widowed males, P-YS♂ and his son -WWS♂. She accepted food from the father, but rejected offers

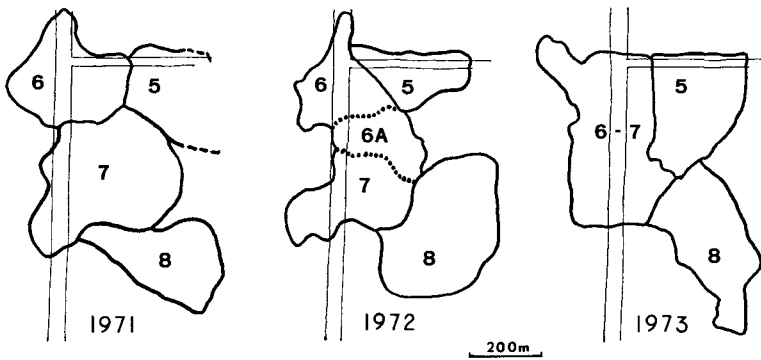


Fig. 1. Outlines of certain Scrub Jay territories during three successive breeding seasons. A north-south railroad right-of-way and a narrower east-west lane are fixed objects. For further orientation, territory 6 in 1971 comprised 6 ha. In 1971 the entire boundary of territory 5 was not determined. The dotted lines represent boundaries that disappeared late in the 1972 season.

from the son. Occasionally she helped both defend their recently formed joint territory.

Before the 1973 breeding season the two males that courted –PidGS♀ paired with older experienced breeders, one of which was her widowed stepmother (see Table 1). Thus at the onset of breeding –PidGS♀ remained in new territory 6–7 (Fig. 1, 1973) with a pair that included her stepmother, and also with an immature female that she had helped raise. She often remained in the southeast corner of territory 6–7 away from the activities of the pair, the male of which now often was aggressive towards her. Sometimes she was joined by the immature, IBS-W♀, toward whom the breeding male, P-YS♂, also was aggressive.

On 2 April –PidGS♀ was seen defending the southeast boundary of territory 6–7. The pair Y-dBS♂ and W-SY♀ were together in territory 8. Although the behavior of this paired female appeared normal, it was noted at the time as unusual that she was not incubating. By mid-April 1973, 21 of 24 experienced breeders were incubating or brooding, as is typical of the population during most years (Woolfenden *ibid.*).

By 12 April –PidGS♀ had moved into territory 8 where she and Y-dBS♂ were seen lining a nest. The male fed her three times during a brief period of observation, providing further evidence that the two had formed a pair bond, and within the previous 10 days. Immediately after witnessing the courtship feeding W-SY♀ was seen within the territory and about 130 m away. She appeared abnormally inactive, and

TABLE 1  
THE 1971-1973 HISTORY OF THE SCRUB JAYS INHABITING TERRITORIES 6 AND 6A

Year	Individual jays <sup>1</sup>	History
1971	Breeders (6): P-YS ♂ O-IGS ♀ Helpers: Pi-RS ♂ -WWS ♂ Fledglings: OdGS-?† IGdGS-?†	Pi-RS ♂ begins dispersing to territory 5 in September following death of its resident breeding male. He breeds in territory 5 in 1972 with the resident female.
1972	Breeders (6A): -WWS ♂ RR-S ♀ † Fledglings: None Breeders (6): P-YS ♂ O-IGS ♀ † Fledglings: None	-WWS ♂ establishes territory 6A (see Fig. 1) with RR-S ♀ who disperses from a natal territory 1400 m away.  During the first week in May O-IGS ♀ is killed on the nest, RR-S ♀ disappears, and -WWS ♂ joins P-YS ♂, thus dissolving the boundary between them. A few days later -PidGS ♀, helper from territory 7 (see Table 2), begins making frequent visits to 6-6A. She accepts food from P-YS ♂, rejects that offered by -WWS ♂, and on occasions, assists both in defending 6-6A from the occupants of territories 5 and 8.  In August PR-S ♀, stepmother of -PidGS ♀, begins pairing with P-YS ♂ after her sick mate IG-dGS ♂ loses her and his territory 7 (see Table 2 and Fig. 1) to the combined efforts of P-YS ♂ and -WWS ♂.
1973	Breeders: P-YS ♂ PR-S ♀ Associate: IBS-W ♀ Fledglings: S-IGR? S-PiR?†	In February -WWS ♂ moves to territory 5 where he replaces Pi-RS ♂ who disappeared after September 1972. IBS-W ♀, daughter of PR-S ♀ (see Table 2), is prevented from feeding the young by P-YS ♂.

<sup>1</sup> ? = sex unknown, † = disappeared (probably died) before next breeding season.

possibly sick. With peanuts offered by us, Y-dBS ♂ was enticed away from the nest site and over to where W-SY ♀ was perched. He arrived and fed her one time, after which she fled. At that instant -PidGS ♀ was seen flying in from the distance in an aggressive manner.

The three inhabitants of territory 8 remained together throughout the nonbreeding months of late 1973 and early 1974. No other jays were seen with them during the monthly censuses. -PidGS ♀ continued to dominate W-SY ♀, who thus was forced to confine her activities to the periphery of those of the other two birds. Aggressiveness towards W-SY ♀ by Y-dBS ♂ was never seen whether -PidGS ♀ was present or absent.

In spring 1974 both females made two attempts at nesting. Unfor-

TABLE 2  
THE 1972 HISTORY OF THE SCRUB JAYS INHABITING TERRITORY 7

Year	Individual jays <sup>1</sup>	History
1972	Breeders: IG-dGS ♂† PR-S ♀	In April -PidGS ♀ assists her father and stepmother fledge two nestlings.
	Helper: -PidGS ♀	In May -PidGS ♀ disperses to territory 6-6A (see Table 1).
	Fledglings: IBS-W ♀ PiS-W?†	Following breeding IG-dGS ♂ begins molt; old feathers drop, but only abortive quills replace them. IG-dGS ♂ becomes flightless, loses his mate and territory to P-YS ♂ (see Table 1) and leaves the area.

<sup>1</sup> See Table 1 for explanation of symbols.

tunately, proof of fertile eggs was obtained only for -PidGS ♀. During both sets of nesting attempts -PidGS ♀ preceded W-SY ♀. First nesting by -PidGS ♀ began about 17 March, that of W-SY ♀ about 31 March. Both failed before hatching. Renesting by -PidGS ♀ began about 22 April, that of W-SY ♀ not until about 6 May. The male was observed being attentive at the second nest of -PidGS ♀, but only until she began incubating, after which he shifted his attentions to W-SY ♀. The first nesting attempts of the two females were about 350 m apart; the second attempts about 175 m apart.

The first nest of W-SY ♀ failed under mysterious circumstances. On 1 April W-SY ♀ was seen to have her breast feathers in disarray. After considerable search the nest was found and one of its two seemingly fresh eggs was seen to be cracked open. W-SY ♀ probably had been sitting on the broken egg and its fluid had matted some of her breast feathers. The cracked egg was removed and examined; no development was discernible. Between 1969 and 1974 I have examined over 660 Scrub Jay eggs and only this one was cracked. Was this egg perhaps destroyed by -PidGS ♀? The second nest of W-SY ♀ appeared completed on 6 May, at which time it was attended by both adults. On 12 May it was deserted; it never was known to contain eggs.

The first nest by -PidGS ♀ failed prior to hatching. The second nest produced two fledglings, both of which died within a week of leaving the nest and probably much sooner.

Further details regarding the two nestings of -PidGS ♀ suggest reasons why male Florida Scrub Jays normally participate in raising young. In 1974 her first nest was discovered on 20 March when she was incubating an abnormally small clutch of two eggs. On 3 April two eggs still were being incubated, but on 7 April the nest was empty and no

TABLE 3  
THE 1972-1974 HISTORY OF THE SCRUB JAYS INHABITING TERRITORY 8

Year	Individual jays <sup>1</sup>	History
1972	Breeders: Y-dBS ♂ W-SY ♀ Fledgling: IGS-dG?†	Y-dBS ♂, hatched in 1968 or earlier, fledges one nestling with W-SY ♀ who replaced his missing mate of 1971.
1973	Breeders: Y-dBS ♂ -PidGS ♀ Occupant: W-SY ♀ Fledglings: None	A rare instance of divorce occurs, but W-SY ♀, the divorcee, does not vacate the territory, instead she exists at the periphery of the activities of the breeders. At times, -PidGS ♀ chases her but Y-dBS ♂ does not. No suggestion of breeding by W-SY ♀ exists for 1973.
1974	Breeders: Y-dBS ♂ † -PidGS ♀ † W-SY ♀	Bigamy. Both females make two nesting attempts. Y-dBS ♂ is the only male seen in the territory. (See text for details.)

<sup>1</sup> See Table 1 for explanation of symbols.

longer defended by the female. During the 15 days that incubation was observed (20 March-3 April) Y-dBS ♂ almost totally ignored -PidGS ♀. At times he was sighted by her, and though she begged audibly and fluttered her wings as she sat on the nest he never was seen to bring her food. Once, on 1 April, when she came off the nest and followed him, begging, he passed her a morsal, and probably this occasionally occurred in the absence of observers. Peanuts we gave the male when he was only a few meters from -PidGS ♀ and her nest were either eaten, carried off to W-SY ♀, or cached.

The unattended -PidGS ♀ rapidly lost weight during incubation. In 1973 on 26 May, when with egg, she weighed 81.8 g. The egg weighed 6.0 g, therefore her weight during a normal breeding was 75.8 g. On 1 April 1974 after about 13 days of incubation and inattention by her mate she had lost 9% of her weight and weighed only 68.7 g. On 7 April the nest was empty; probably she had departed a day or two earlier. On 15 April, before she began reneating, her weight increased to a normal 75.7 g. She started relaying 23 April, and again her mate neglected her. By 6 May her weight had dropped to 69.8 g.

Renesting resulted in a clutch of three eggs, which is below the mean of 3.6 for second clutches in this population (Woolfenden 1974, op. cit.). Two eggs hatched on 11 May; the third egg never hatched. The male ignored the young as well as the female. With help from field companions I enticed the male to within sight of the nest and nestlings to provide proof he knew of their existence, and still he did not feed them. Soon the two nestlings were grossly underweight even though the fe-

male was feeding no more young than does an individual of a normally functioning pair with four nestlings. Nestling weights were taken three times: day 8 when normal young average 32.8 g, day 9 when they average 38.2 g, and day 14 when they average 56.6 g (Woolfenden MS). With no more than a 2.5 g range between the two young during each day of weighing, the starving nestlings averaged 21.5 g, 20.8 g, and 34.3 g on these days. On 25 or 26 May, at age 15 days, one young was missing from the nest. Probably it fledged. A few days later the other young disappeared. Based on circumstantial evidence, it too probably fledged. Neither young was ever seen again; most likely they died within a day or two of leaving the insulative protection of the nest.

#### DISCUSSION

Extensive study of Scrub Jay breeding behavior suggests three possible reasons for the pairing of an unpaired female with a mated male. These are listed in my order of decreasing probability. Sickness may have reduced the effectiveness of W-SY ♀ as a normally functioning breeder, thereby weakening her bond with Y-dBS ♂. I have previously witnessed the dissolution of a pair bond following, and probably brought on by, injury of a mated female. W-SY ♀ may have had a nest that was never found, in which case her absence from the vicinity of her mate during incubation may have provided the time needed by -PidGS ♀ to form a bond with Y-dBS ♂. As W-SY ♀ was seen regularly during the 1973 breeding season this possibility does not seem too likely. The unpaired -PidGS ♀ may have been aggressive enough to move into the territory of normally functioning breeders and pair with the male.

The failure of an unassisted female to raise two healthy fledglings, despite the fact that pairs regularly succeed in raising twice as many, provides clues as to why in Florida Scrub Jays both parents care for their young. It also suggests why the helper system described previously (Woolfenden 1975, *op. cit.*) may have evolved in the population. The need for persistent diurnal brooding or shading seems of minor importance to Florida Scrub Jays, and especially in the case at hand. The lone female had nestlings late in the breeding season when the generally high ambient temperatures reach their peak for the cycle. Furthermore the nest was shielded from direct sunlight by dense foliage. Nevertheless often -PidGS ♀ remained at her nest when brooding seemed unnecessary, and when, indeed, she sat over the young instead of down on them. Even with normal pairs the females often sit on their nests when ambient temperatures are so high that the young gape and stretch their necks over the nest rim apparently to keep cool. It appears then that the unassisted female could have provided food sufficient for raising two

young, and that often neither brooding nor shading required her presence at the nest, and yet there she often remained.

I suspect that Scrub Jays, singly and especially in groups, are capable of deterring many nest predators. Thus selection may have occurred for a division of labor by breeders in which the male provides most of the food while the female remains at the nest even when brooding or shading are unnecessary. Her presence functions not only as a direct predator deterrent, but also to signal the alarm to others in her family. If true, then the failure of a lone female to provide for only two young may have resulted from a strong and possibly inherited urge to remain at the nest instead of foraging. Finally the fact that even normal pairs produce more young when they have help (Woolfenden 1975, *op. cit.*) may come from the necessity of all breeding females to leave the nest occasionally. At these times the attention given the nest by individuals additional to the pair greatly decreases the time the nest is totally unattended and thereby decreases predation.

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#### SUMMARY

As typifies other corvids, Florida Scrub Jays normally are monogamous. A 6-year study of marked jays yielded one case of bigamy out of 64 breeding units. The social histories of numerous jays suggest reasons for this rare event. A female that was abandoned after being courted by two experienced breeders came to reside in a distant corner of a territory controlled by a recently formed pair. From here she moved into an adjacent territory and paired with a mated male. Delayed breeding and possibly sickness of the resident female may have made possible the forming of a second concurrent pair bond by the resident male. The newly paired female dominated the original mate and apparently was the only bird that bred during the first year of occupancy. During the next breeding season each female nested two times, but each time the subordinate bird began nesting only after the dominant was incubating.

Only the second nesting of the dominant female hatched eggs and fledged young. The nestlings were cared for only by their mother; they fledged at only 40% normal fledging weight, and died within a few days

after leaving the nest. Individual breeding Scrub Jays often have a feeder to nestling ratio of 1:2, and yet the lone female's two young were starving. Breeding female Scrub Jays of normal pairs spend a great deal of time at their nests when they contain young, in part to brood, but perhaps also to dissuade predators. Perhaps the lone female could have provided more food if she could have broken a strong urge to remain at the nest.

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