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Replacement nesting and polyandry in the Wattled Jacana.—Although polyandry has been documented for the Bronze-winged Jacana (*Hydrophasianus chirurgus*) (Hoffman, Ornithol. Bericht 2:119–126, 1950) and Northern Jacana (*Jacana spinosa*) (Jenni and Collier, Auk 89:743–789, 1972) its occurrence in the Wattled Jacana (*J. jacana*) has been speculative (Osborne and Bourne, Condor 79:98–105, 1977). Polyandry in *J. jacana* is predicted because females are freed from parental care of the precocial young (Osborne and Bourne 1977) thus potentially enabling them to lay additional clutches (Pitelka, Holmes and MacLean, Am. Zool. 14:185–204, 1974) and to monopolize several mates (Emlen and Oring, Science 197:215–223, 1977). In this paper, I report my observations on productivity, replacement nesting and pair bonding for jacanas breeding in coastal Guyana, and describe polyandry in this species for the first time.

Study area.—Field studies were conducted on a 28 ha study plot at Burma of MARDS, Guyana, South America, from June–November 1977. MARDS is under intensive rice cultivation and experiences two wet and two dry seasons annually (Giglioli, Crop Histories and Field Investigations 1951–1957, British Guiana Rice Develop. Co. Ltd., Georgetown, Guyana, 1959). During the 1977 study period the wet season extended from May–July, the dry season from August–November. The study plot, partitioned by dikes and canals, consisted of 90% ricefields, 4% drainage ditches, 3% cattle paddocks and 3% ponds, and was surrounded by about 1600 ha of ricefields.

Productivity.—Nests were checked daily over the 6 months and their success determined. Nest and egg loss was high. Of 52 nests, only eight (15.4%) were successful in producing at least one young. Fates of the precocial young after leaving the nest were not followed. Known causes of nest and egg loss included lizards (1.9%), Long-winged Harriers (*Circus buffoni*) (5.8%), children (5.8%), grazing cattle and horses (19.2%), and harrowing and drainage of the ricefields (9.6%). Thus, natural predators accounted for 7.7% of the known nest and egg loss and human related activities for 34.6%. Thirty-five percent of the nests were lost to unknown causes, perhaps to changing water depths, and 7% were presumed deserted.

Pair bonds and replacement nesting.—Jacanas were captured by mist-net, sexed by weight (Osborne and Bourne 1977) and marked with colored plastic leg bands (identified in this paper by acronyms or capital letters, e.g., WO/O and D, respectively). Censuses of the marked population were made twice weekly from June–November to determine pair bond relationships and the frequency of replacement nesting. The existence of a pair bond between a male and female was inferred from their foraging together on the territory, territorial defense and precopulatory behavior (Osborne and Bourne 1977). Many, but not all pairs were observed during repeated copulations.

Thirty-four males and 19 females were marked. Nineteen birds (38% of the males and 31% of the females) left the study area. Twenty-one of the 34 males (61.8%) and 13 of the 19 females (68%) nested in the study area. Eight of 21 males (38%) and 2 of 13 females (15.4%) paired with unmarked mates. Nine of 11 females (81.8%) were monogamous, two (18.2%) were polyandrous.

Females responded to acts of predation or nest destruction by laying replacement clutches

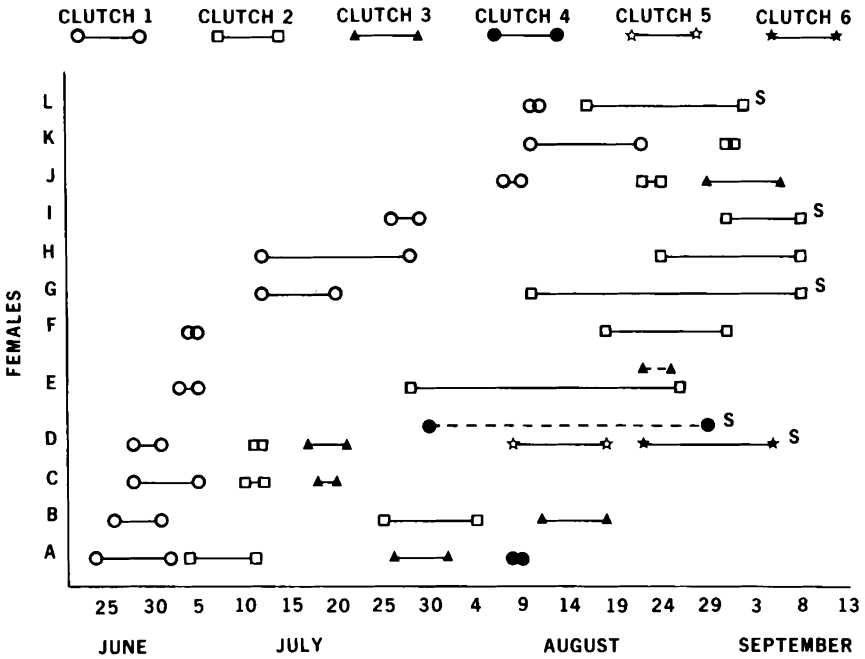

FIG. 1. Nest replacement of marked Wattled Jacanas, 1974 and 1977. Solid line represents clutches of monogamous females; dashed line represents females having pair bonds and mating with another male. S = nests successful in producing at least one young. The length of each line is the duration of each clutch before predation or hatching of young. Data for female A are from Osborne and Bourne (1977).

with the original or different male (Fig. 1). Average interval between the loss of a nest or its contents and the completion of a new nest platform was 10 days (N = 34, range = 2–25).

Females D and E were biandrous (Fig. 1). Female D laid replacement clutches with male WO/O on a small pond from 28 June–21 July. The first nest (one egg), second nest (four eggs) and third nest (four eggs) were trampled by horses. On 30 July she nested with an unmarked male on a small adjacent pond about 20 m distant. This male hatched 3 of the 4 eggs laid. She also held simultaneous pair bonds with male WO/O and actively foraged in and defended each pond. Clutch five incubated by WO/O contained four eggs which were taken by children on 18 August. Clutch six (four eggs), incubated by male WO/O, was successful; one young was seen and both parents gave distraction displays.

Female D laid six clutches of eggs incubated by two different males. With an average weight of 38.7 g/4-egg clutch (Osborne and Bourne 1977), female D potentially laid 232.2 g of eggs (1.37 × her body weight) in 60 days.

Female E and male GW/W mated in a drainage ditch on 3 July. The empty nest was abandoned on 5 July. They remained paired and a second nest was constructed on 29 July. Its four eggs were destroyed on 26 August. While male GW/W incubated this clutch female E held simultaneous pair bonds with male BO/O in the same drainage ditch. The eggs incubated by BO/O were destroyed shortly after the second egg was laid.

Of the 69 nests, 26 (37.7%) were initiated in the wet and 43 (62.3%) during the dry season. Both sexes were reproductively active throughout the study and more nests were successful as breeding progressed. Two of 12 marked females (17%) switched from a monogamous to a polyandrous system. Because females D and E actively defended territories of multiple mates their mating system is classified as a resource defense polyandrous system (Emlen and Oring 1977).

Discussion.—Low success rates of reproductive attempts characteristic of jacanas in this study have also been found in polyandrous Northern Jacanas (Jenni, Am. Zool. 14:129–133, 1974) and Spotted Sandpipers (*Actitis macularia*) (Oring and Knudson, Living Bird 11:59–73, 1972). The ability of females to rapidly lay replacement clutches is also very impressive in phalaropes (Schamel and Tracy, Bird-Banding 48:316, 1977), and in Spotted Sandpipers—in one case a female laid 20 eggs (400% of her body weight) in 42 days (Emlen and Oring 1977).

Both incidences of polyandry and all five successful nests of the marked population occurred during the dry season. Unfortunately we know little about the seasonality of reproduction in Wattled Jacanas. A small marked population was monogamous in the 1974 wet season, but a female was suspected of exhibiting polyandry in August (Osborne and Bourne 1977). Nests have been reported for January, and March–September for Wattled Jacanas breeding in Surinam (Haverschmidt, Birds of Surinam, Oliver and Boyd, Edinburgh, United Kingdom, 1968). In Costa Rica, peak nesting of Northern Jacanas was at the beginning of the wet season but polyandry occurred throughout the year (Jenni and Betts, Anim. Behav. 26:207–218, 1978).

Reproductive success and the occurrence of polyandry may be related to the spatial distribution of resources (Emlen and Oring 1977). Jenni and Collier (1972) found shallow ponds in Costa Rica optimal breeding habitats for polyandrous Northern Jacanas. Interestingly, although ponds and drainage ditches together comprised only 7% of the study area, all successful nestings and polyandrous pairings of the marked population were in these habitats.

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Habitat of Bachman's Sparrows breeding on Missouri glades.—Bachman's Sparrow (*Aimophila aestivalis*) is an uncommon species occurring locally throughout the southeastern United States. In recent years, declining populations and uncertainty as to the bird's status have led to its being placed on the "early-warning" Blue List (Arbib, Am. Birds, 25–32, 1971–78) and to its designation as "rare" in Missouri by Nordstrom et al. (Rare and Endangered Species of Missouri, Missouri Dept. Conserv. and U.S. Soil Conserv. Serv., 1977). Missouri is at the northwestern border of Bachman's Sparrow breeding range (A.O.U. Check-list Committee, Check-list of North American Birds, 5th ed., Lord Baltimore Press, Baltimore, Maryland, 1957).

Bachman's Sparrows use pine barrens in South Carolina, grassy fields in Mississippi and