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BREEDING BEHAVIOR OF ELEGANT TROGONS IN SOUTHEASTERN ARIZONA

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ABSTRACT.—We studied the behavior and phenology of nesting Elegant Trogons (*Trogon elegans*) in the Chiricahua, Huachuca, and Santa Rita mountains in southeastern Arizona in 1993 and 1994. We found 34 nests and 11 cavities that were investigated by trogons but never occupied. Adults reared young successfully in 24 nests, but abandoned 5 nests after egg laying; 5 nests had unknown fates. Incubation lasted an average of 19 days; feeding of young lasted 15 days. Nesting phenology was extremely variable: six nests were started in May and contained nestlings or had fledged young by late June; eight nests were started in June and finished by late July; six nests were started in July and had fledged young by late August. Rates and durations of incubation, brooding, and feeding of nestlings were equal between adult male and female trogons except in two cases. Rates between years were different in six cases. Males called significantly more often than females. Elegant Trogons nesting in Arizona have different behaviors from other Neotropical members of the Trogonidae, especially with regards to their durations of incubation and feeding. Also, they feed nestlings insects rather than fruit. *Received 24 February 1995, accepted 27 April 1995.*

THE ELEGANT TROGON (*Trogon elegans*) is a monogamous, secondary-cavity-nesting species whose range extends from northwestern Costa Rica to the extreme southwestern United States (AOU 1983, Taylor 1994). The only breeding populations found in the United States are small and are concentrated primarily in the Atascosa, Chiricahua, Huachuca, and Santa Rita mountains in southeastern Arizona (Taylor 1994). Because of the trogon's rarity in Arizona and the fact that its habitat requirements are virtually unknown, the Arizona Game and Fish Department listed the bird as a "Candidate IV" sensitive species, one for which threats are suspected but for which substantial population declines from historical levels have not been documented (Arizona Game and Fish Department 1988).

The small amount of information available on breeding populations in Arizona indicates that both male and female trogons arrive in the four ranges listed above in mid-April, after apparently migrating from northern Mexico (Lane 1974, AOU 1983, Taylor 1994). After arrival, males compete with each other to establish territories in pine-oak mountain drainages and begin actively courting females (Marshall 1957, Taylor 1994, Hall unpubl. data).

Very little information is available about species of the family Trogonidae, and especially the Elegant Trogon. Early natural-history accounts by Skutch (1942, 1944, 1948, 1956, 1959, 1962) on several trogon species in Mexico and Central America did not include the Elegant Trogon. In the United States, Taylor (1994) conducted primarily qualitative studies of *T. elegans* from 1979 to 1982, and his data represent some of the only relatively long-term information available on the species prior to 1993. During 1993-1994, we studied the breeding behavior and nesting phenology of the Elegant Trogon to quantify its habits in Arizona. Although we wanted to describe nesting characteristics of Elegant Trogons in general, we also were interested in determining whether there were differences between males and females in the amount of time they tended nests because Taylor's (1994) work and that of Skutch (1942-1962) on other trogon species showed that adult trogons share nest duties. Furthermore, we were interested in nest-defense behavior by adults because observations have indicated that trogons vigorously defend their cavities (Cully 1986, Taylor 1994).

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STUDY AREAS AND METHODS

Study area.—We studied Elegant Trogons from late May to mid-August 1993 and 1994 in the Huachuca (31°32'N, 110°19'W), Santa Rita (31°46'N, 109°21'W), and Chiricahua (32°0'N, 110°19'W) mountains. Common overstory trees in canyons where trogons nested included alligator juniper (*Juniperus deppeana*), Mexican pinyon (*Pinus cembroides*), Apache pine (*P. engelmannii*), Chihuahua pine (*P. leiophylla*), silverleaf oak (*Quercus hypoluecoides*), emory oak (*Q. emoryi*), netleaf oak (*Q. reticulatum*), Arizona white oak (*Q. arizonica*), and hybrids of the above-listed oak species. Arizona sycamore (*Platanus wrightii*), black walnut (*Juglans major*), and several species of ash (*Fraxinus* spp.) occurred in the riparian woodlands in these drainages. Common upland and riparian understory vegetation included a number of young overstory plants: squawberry (*Rhus trilobata*), New Mexican locust (*Robinia neomexicana*), mountain mahogany (*Cercocarpus betuloides*), agave (mostly *Agave palmeri*), and yucca (*Yucca* sp.; Kearney and Peebles 1960, Hall pers. obs.).

From mid-July through September, southeastern Arizona experiences weather patterns characterized by strong, local, and brief thundershowers in the afternoons. April and May in the mountains are cool during the day and night ($\bar{x}$ = 18°C). June and July are hot ($\bar{x}$ = 25°C); August and September are cooler ($\bar{x}$ = 23°C) because of the rainstorms (Sellers and Hill 1974). Average rainfall across April and May in the Huachuca Mountains is 0.33 cm (1954–1970), in June is 0.97 cm, and across July–September is 8.46 cm (based on data collected at 1,425 m elevation; Sellers and Hill 1974).

Nests.—Trogon nests were located in two ways in 1993 and 1994. First, in order to solicit responses from breeding adults, we played tapes of trogon territorial calls in canyons with historical records of nesting trogons. We followed the adults that responded to their nest areas, and searched for potential nest sites (i.e. cavities in living or dead trees). We then monitored potential cavities and recorded our observations of trogon activities at the sites. Second, we attached radio transmitters to 11 adult trogons (4 males and 1 female in 1993; 5 males and 1 female in 1994) to monitor their movements for about two months each during their breeding seasons (i.e. April to August).

Nest observations.—We observed the nesting behavior of Elegant Trogons from blinds or other camoflauged locations at about 25 m from each nest, with an average of 4.0 ± SD of 1.9 h per observation period in 1993 (n = 90 days) and 3.0 ± 2.5 h per period in 1994 (n = 45 days). We recorded the time of day, frequency, and duration of trogon nesting activities at and around nest sites in a continuous written log. When possible (because trogons had their backs to us at the cavities on many occasions) we also identified prey items fed to nestlings by adults. All notes were summarized and tabulated by one author (J.O.K.) to reduce interobserver bias.

When summarizing the observation data, we assigned each nest a reproductive-period status (advertisement, laying, incubating, brooding, feeding, or fledged) based on the recorded behaviors of the adults and young during each period. Advertisement behavior was determined based on notes from Taylor (1979–1983, unpubl. reports for the Coronado National Forest, U.S. Forest Service), and on our familiarity with bird nesting behaviors. Each male trogon we observed advertised his selected nest cavity by remaining in the vicinity of the tree all day and calling continuously. When a female trogon was not right next to the proposed cavity, the male called loudly from perches near the cavity to attract her. If the female came close to the nest, the male usually flew to a perch in the nest tree and called softly but insistently. If the female remained in the area, the male perched at the cavity entrance and/or entered the cavity, still calling softly and constantly. If the female flew away while the male was calling from inside the cavity, the male would fly out and resume calling loudly. During a typical day a female typically passed within 25 m of an advertising male and his cavity three or four times. Males often perched on a cavity lip, looked into the cavities while calling, looked around, and then looked back into the cavities. This behavior could continue for days (e.g. one male on which we had numerous observations promoted his cavity tree for about one month until a female finally accepted the nest).

Laying behavior was recognized based on descriptions from Allen (1944), and our familiarity with laying behavior in other bird species. During laying sessions, both males and females remained within 25 m of the cavity and were very vocal, entering and exiting the cavity repeatedly. When approaching the nest, the trogons perched at the lip of the cavity prior to entering, and peered inside. Males entered and exited the cavities frequently; females did so also, but to a lesser degree. As with other bird species (e.g. Bowers and Dunning 1994), female trogons apparently lay only one egg per day.

Once incubation was completed, it sometimes was difficult to determine whether adults were brooding or feeding in the first couple of days while nestlings were fed. Therefore, we considered an adult to be brooding if it remained inside the nest for 15 or more min/h, or feeding if it was inside less than 15 min/h.

We recorded the final status of each potential or used nest at the end of each field season. A nest was considered: investigated if an adult male or female entered the cavity and/or called from it on one or more occassion, but never laid eggs in it; abandoned if eggs were laid in a cavity and then the trogons deserted the nest prior to hatching; successful if one or more young fledged, or if the nestlings were less than one week from fledging, but were not seen outside the cavity; or unknown if the fate of a nest with eggs was uncertain.

We also recorded the frequency and apparent cause of vocalizations by the adult male or female within 30 m of the nest. We classified the cause of vocalization as: "disturbance" if the trogon's call was a reaction to a loud noise, possible predator, interspecific competitor, human being, or some other potential threat; "new trogon" if the call was in response to another trogon that was not a member of the nesting pair; or "unknown" if the cause of the call was uncertain. A fourth category, "switch," was used to indicate a call by either an incubating or brooding bird, or by a trogon approaching the nest, to signal a change in incubating or brooding duties. If the pair was feeding nestlings, the switch classification referred to the call made when both parents arrived simultaneously to feed, or when one trogon arrived, while the second bird was in the cavity feeding.

Statistical analyses.—Incubation, brooding, and feeding data were converted to rates (min/h) for standardization and were tested for normality by year, status, and nest location (Kolmogorov-Smirnoff goodness-of-fit test; Zar 1984). All variables except those describing calling rates were normally distributed and, therefore, all data except those for call rates were analyzed with parametric tests.

We conducted Student's two-tailed *t*-tests (Zar 1984) to compare the rates of incubation, brooding, feeding, and calling between sexes within each year and between years. Wilcoxon and Mann-Whitney *U*-tests (Zar 1984) were used to compare call rates between sexes and years. To describe calling by trogons we conducted Pearson product-moment correlations (Zar 1984) of call rates versus rates of incubation, brooding, and feeding between both years for males (because they called most often).

The fates of nests (successful vs. abandonded) were compared among canyons and years using log-likelihood *G*-tests (Zar 1984). Only nests from the Huachuca Mountains were included in this analysis because we found the most nests in this range. The canyons we selected for comparison were also the ones with the densest populations of nesting trogons, as determined from our surveys and radiotelemetry reconnaisance.

Analyses were conducted with SPSS/PC+ software (Norusis 1990). All test results were considered significant if $P \leq 0.05$.

RESULTS

Nests.—We found 46 nests or investigated cavities: 12 in 1993, and 34 in 1994. Of these, 11 cavities were only investigated by trogon pairs; five were abandoned after egg laying; 24 successfully reared young to near-fledging or fledging; and five had unknown fates. No nests were known to have been predated in either year. Nesting habitat for Elegant Trogons ranged from 1,500 to 2,500 m in canyons. We found trogons nesting in 17 different drainages that were generally without running water for most of the summer (except immediately following rainstorms). However, intermittent standing water occurred in small pools in most canyons with trogons. Of the nests found, 80% (37) were in sycamore trees, 4% (2) in Arizona white oaks, 4% (2) in Gooding's willows (*Salix goodingii*), and 2% (1) each in a silverleaf oak, a netleaf oak, a hybrid of netleaf and Arizona white oaks, a pine snag, and a black walnut.

There were no significant differences in the proportions of successful versus abandoned nests among the canyons with the densest Elegant Trogon populations in the Huachuca Mountains in 1993 ($G = 7.8$, df = 5, $P = 0.17$), or 1994 ($G = 2.2$, df = 4, $P = 0.70$).

Phenology.—Calculations of phenology were based on five nests from 1993 for which we had more than 80 h of observations each. The average duration of the nesting cycle was 37 ± SD of 3.3 days. The mean length of incubation was 19 ± 1.7 days, and mean length of feeding was 15 ± 3.1 days. Nesting phenology was extremely variable for nests we observed in 1993 and 1994: six nests were started in May and had nestlings, or had fledged young, by late June; eight nests were started in June and were finished by mid- to late July; six nests were started in July and had fledged young by late August. Laying and incubation occurred at nests from 11 May through 1 August; brooding occurred from 3 June through 6 August; and feeding occurred from 2 June through 20 August. Thus, individual nests were started throughout the entire spring and summer.

Courtship and nest advertisement.—We recorded 995 h of notes while observing trogons at nest sites, 775 h in 1993 and 220 h in 1994. Male courtship behavior was documented on 17 occasions. Courtship displays were used by them when near females and included tail flicking (or "pumping"), inflating their crimson chests while facing females, and following females from perch to perch while calling at them in low pitches. Copulation was observed on 11 occasions, in 3 instances occurring at least twice in 1 h.

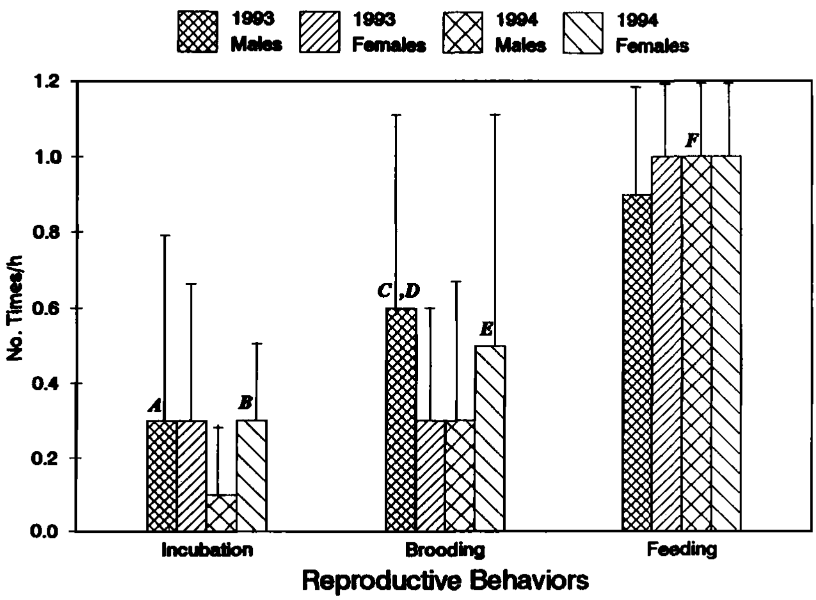

FIG. 1. Average no. times/h (+1 SD) that male and female trogons incubated, brooded, and fed nestlings in 1993 and 1994. Letters indicate significantly different means (all $P \leq 0.05$): (A) 1993 males > 1994 males; (B) 1994 females > 1994 males; (C) 1993 males > 1993 females; (D) 1993 males > 1994 males; (E) 1994 females > 1993 females; and (F) 1994 males > 1993 males.

One of the primary components of trogon courtship was nest advertisement. This behavior was observed on seven occasions, for a total of 35 h. Most of our observations of nest advertisement were made on one radio-marked male in 1994 ($n = 4$ days, 25 h total). Advertising males called loudly from perches 15 to 30 m from the cavity at a rate of 160 ± 69.9 calls/h. Females were less vocal, calling at a rate of 12 ± 15.3 calls/h when outside the cavity. Males entered proposed cavities about two times every 3 h and females entered about one time every 3 h.

Laying.—This behavior was only observed twice, once at a nest in 1993 and once in 1994, for a total of 10 h of observations. During laying, both the male and female remained within 25 m of the cavity and were very vocal, entering and exiting the cavity repeatedly. Males and females called at least 50 times/h; both sexes called at steady rates regardless of whether they were inside or outside the cavity. Females entered cavities about six times every 5 h, remaining inside about 11 min/entry, whereas males entered cavities about five times every 5 h, for about 14 min/entry, presumably to perform short incubation bouts or to turn eggs (Skutch 1976).

Incubation.—We recorded 508 h of observation during incubation, 418 h in 1993 (observation period, $\bar{x} = 4.6 \pm 1.8$ h), and 90 h in 1994 ($\bar{x} = 4.1 \pm 2.4$ h). There were no significant differences in average incubation rates (*t*-test, $P = 0.12$) or the average number of incubation bouts ($P = 0.57$) between males and females in 1993 (Figs. 1 and 2). In 1994, the number of times females incubated was significantly higher than that for males ($P < 0.001$), but there was no significant difference between the sexes in the amount of time spent incubating eggs per hour ($P = 0.14$; Figs. 1 and 2). Males incubated for more bouts in 1993 than 1994 (*t*-test, $P = 0.001$), but did not spend more time on the eggs in 1993 ($P = 0.58$; Figs. 1 and 2). Females spent more time incubating in 1994 than 1993 ($P < 0.001$), but there was no difference in the number of incubation bouts between years ($P = 0.99$; Figs. 1 and 2).

Brooding.—We recorded 58 h of observations during brooding, 43 in 1993 (observation period, $\bar{x} = 4.3 \pm 1.2$ h) and 14 in 1994 ($\bar{x} = 2.4 \pm 2.4$ h). Males brooded significantly more times than females in 1993 (*t*-test, $P = 0.01$), but the durations of brooding did not differ between the sexes ($P = 0.52$; Figs. 1 and 2). Females brooded for more bouts in 1994 than in 1993 (*P*

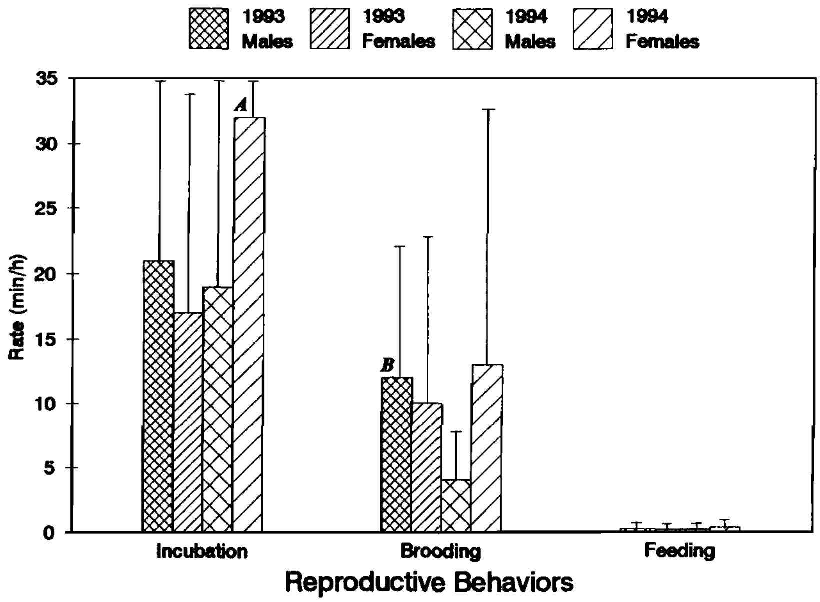

Fig. 2. Average rates (min/h) (+1 SD) that male and female trogons incubated, brooded, and fed nestlings in 1993 and 1994. Letters indicate significantly different means ($P < 0.001$): (A) 1994 females > 1993 females; (B) 1993 males > 1994 males.

= 0.001; Fig. 1), but males brooded significantly more often and for more total time in 1993 than 1994 (both $P < 0.001$; Figs. 1 and 2). There were no significant differences between the sexes in 1994 ($P = 0.31$–0.49; Figs. 1 and 2).

Feeding.—We recorded 308 h of observations during feeding of nestlings, 235 h in 1993 (observation period, $\bar{x} = 4.1 \pm 1.9$ h), and 73 h in 1994 ($\bar{x} = 2.6 \pm 2.5$ h). There were no significant differences in feeding rates or number of feeding bouts between males and females in 1993 (t-test, $P = 0.61$–0.96) or 1994 ($P = 0.25$–0.53). Male trogons fed nestlings during more bouts in 1994 than 1993 ($P = 0.03$; Fig. 1), but did not feed for more total time in 1994 ($P = 0.99$; Fig. 2). There were no significant differences among 1993 and 1994 feeding data for females ($P = 0.09$–0.99; Figs. 1 and 2).

We observed males delivering insects to nestlings on 21 occasions across both years, including seven Orthoptera (33%), five Lepidoptera (24%), three Coleoptera (14%), and two (9.5%) each of Homoptera, Hymenoptera, and Odonata. We saw females deliver food 13 times: five Lepidoptera (38%), four Orthoptera (31%), three Coleoptera (27%), and one Mantoidea (8%). We never observed adult trogons feeding fruit to nestlings.

Vocalizations.—In 1993 and 1994, male trogons called significantly more often than females overall (Mann-Whitney U-test; 1993, all $P < 0.03$; 1994, all $P < 0.02$; Table 1). In 1993, the total amount of calling done by males did not vary between the reproductive phases of the nesting cycle ($P = 0.17$–0.55). Female trogons in 1993, however, called significantly more often during incubation than during feeding ($P = 0.01$). In 1994, calling did not vary significantly between phases of the nesting cycle for males ($P > 0.06$), but females called more often from inside their cavities during incubation than during feeding ($P = 0.05$). Males called more often in 1994 than 1993 ($P = 0.04$), but called for more total time in 1993 ($P = 0.002$).

The analysis of causes of vocalizations indicated that males and females called at the same rates in 1993 and 1994 when they were disturbed at their nests or bothered by new trogons (Table 1). However, males and females called more often in 1993 during nest switches than they did in 1994 (both $P \leq 0.05$; Table 1).

Male calls were positively associated with feeding ($r^2 = 0.18$–0.72, all $P \leq 0.001$) rather than with incubation or brooding (all $P \geq 0.48$), indicating that they called more often during the former reproductive stage. Disturbance data

TABLE 1. Average calling rates (no. calls/h) and suspected causes of calls during incubation, brooding, and feeding for male and female Elegant Trogons in southeastern Arizona, 1993 and 1994.[a]

Sex	1993 Incubation	1993 Brooding	1993 Feeding	1994 Incubation	1994 Brooding	1994 Feeding
Disturbed at nest						
Male	3 ± 13.4	0.4 ± 0.6	3 ± 7.3	5 ± 17.4	0.6 ± 1.5	5 ± 8.0
Female	1 ± 4.6	—[b]	3 ± 17.7	5 ± 21.3	0.2 ± 0.6	4 ± 10.2
New trogon						
Male	4 ± 19.1	—	3 ± 11.0	0.7 ± 2.7	—	3 ± 15.1
Female	1 ± 0.8	—	1 ± 6.0	—	—	—
Switch						
Male	2 ± 4.9	3 ± 2.8	0.6 ± 1.5^{A}[c]	1 ± 2.4	0.3 ± 0.5	0.2 ± 0.9^{A}
Female	1 ± 1.5	2 ± 1.1^{B}	0.5 ± 1.2	1 ± 2.5	0.4 ± 0.5^{B}	—
Unknown cause						
Male	8 ± 16.6	3 ± 2.6	4 ± 9.0	1 ± 1.8	1 ± 3.4	1 ± 3.9
Female	1 ± 4.5	1 ± 2.1	2 ± 6.6	0.3 ± 1.4	1 ± 2.5	0.2 ± 0.6
Total						
Male	17 ± 30.1^{C}	7 ± 4.9^{D}	11 ± 18.2^{E}	8 ± 17.6^{F}	12 ± 19.1^{G}	9 ± 19.2^{H}
Female	4 ± 7.0^{C}	3 ± 3.2^{D}	7 ± 19.5^{E}	7 ± 21.0^{F}	3 ± 3.8^{G}	4 ± 10.2^{H}

[a] Causes of calls: (disturbed at nest) trogon's call was in reaction to disturbance near nest; (new trogon) call in response to trogon that was not of the nesting pair; (switch) a call signaling change in incubating, brooding, or nestling feeding duties; (unknown cause) cause of call was uncertain.

[b] Dash indicates no trogon calls recorded in response to disturbance type during this phase of nesting cycle.

[c] Superscript capital letters that are similar indicate significant differences ($P < 0.05$) between yearly means (letters A and B), and male and female means (letters C–H).

that we recorded anecdotally during the two years indicated that Elegant Trogons called at and responded most often to Arizona gray squirrels (*Sciurus arizonensis*), Sulfur-bellied Flycatchers (*Myiodynastes luteiventris*), and Northern Flickers (*Colaptes auratus*) around their nests (log-likelihood G-test = 30.2, df = 16, $P = 0.02$). Their most common reactions were flying out of their cavities, calling, and physically attacking and/or chasing these perpetrators.

DISCUSSION

Our findings indicate that rates and durations of incubation, brooding, and feeding in 1993 and 1994 generally were equal for male and female Elegant Trogons, and that there were few differences between years for both of the sexes. Taylor (1994), in the popular literature, also reported that the time expended by males and females in incubation and feeding were roughly equal, based on his nest observations from 1979 to 1982. Our results were partially confounded, however, by the large variability we saw in 1993 and 1994. The variability was present both in our 1993 data set, with 775 h of observations, and our smaller (n = 220 h) 1994 data set. Thus, some variability is probably inherent in the breeding behaviors of Elegant Trogons. However, if future researchers want to more precisely elucidate sexual differences, they should conduct longer-term, more intensive nest-monitoring studies.

Some comparisons between Elegant Trogons and other members of the family Trogonidae can be made based on work by Skutch (1942–1962) on trogon species in the Neotropics. For example, Elegant Trogons in Arizona differed from other Neotropical trogons in their incubation patterns. According to Skutch (1944), only the Resplendent Quetzal (*Pharomachrus mocinno*) and possibly the Mexican Trogon (*T. mexicanus*; which also showed high variability in its daily schedule) followed the same incubation patterns as the Elegant Trogon, with the male taking two shifts of intermediate length during the day. All of the other six species he studied apparently followed a schedule with males incubating for only one period of 7 to 8 h, and females incubating for the rest of the time. Skutch found incubation lengths ranging from 16 days in the White-tailed Trogon (*T. bairdi*) to 19 days in the Mexican and Citrolene (*T. citreolus*) trogons (1942, 1948, 1962). Taylor (1994) calculated the average length of incubation at 17 days for the Elegant Trogon. We estimated 19 days with a range of 17 to 21, which still places the Elegant Trogon at the upper end of the scale relative to other trogons.

Skutch (1942–1962) reported that all adult trogons he watched spent between 15 and 17 days feeding nestlings, with the exception of the White-tailed Trogon (25 days) and the Resplendant Quetzal (23–31 days). This places the Elegant Trogon (15 days) at the lower end of the scale. Taylor's (1994) estimate of feeding duration was 20 to 23 days, but he included brooding time in his estimate. If we add our average brooding duration (1.6 days) to our feeding estimate, Elegant Trogons fed for approximately 17 days, similar to Skutch's findings.

Trogon species studied by Skutch fed their young insects for the first few days after hatching, and later supplemented their diets with fruit (or, in the case of the Resplendant Quetzal, with small lizards and frogs). Eguiarte and Martinez del Rio (1985) reported that the Citrolene Trogon used four different fruit species during the dry season in Jalisco, Mexico. However, we never observed Elegant Trogons feeding fruit to nestlings in 1993 and 1994. An Elegant Trogon stomach examined by Cottam and Knappen (1939; collected June 1892 in the Huachuca Mountains) contained only adult and larval lepidopterans. A second specimen examined by them and collected south of the Huachucas (in Teporica, Mexico) contained 68% insects and 32% fruit and plant fiber. Unlike our findings, Taylor (1994) observed Elegant Trogons feeding berries to nestlings on days immediately preceeding fledging at several nests, suggesting that trogons in Arizona will use fruit for nestlings if it is available. Relatively dry years during our study and the uncommonness of berries in southeastern Arizona until September (Hall unpubl. data) may explain why we did not see the birds feeding on berries. During Taylor's work (1978–1982), wet weather conditions may have provided increased availability of fruit; in addition, Taylor's nest observations occurred in relatively mesic canyons.

Another difference between Elegant Trogons and the other Neotropical trogons is the use by the former of preformed cavities. Skutch (1944–1962) reported that the Mexican, Citrolene, Black-throated (*T. melanocephalus*), White-tailed, and Collared (*T. collaris*) trogons, as well as the Resplendent Quetzal, excavated their own cavities either in termitaries or rotted wood. In Arizona, the Elegant Trogon nests exclusively in existing cavities in either live or dead wood (Allen 1944, Hall unpubl. data). Taylor (unpubl. 1983 report for U.S. Forest Service) found that 83% of 59 nests from 1944 through 1982 were constructed by woodpeckers, mostly by Northern Flickers. We never observed trogons excavate wood within their cavities, although on a few occasions we did see them run their bills along the wood near the entrances.

Finally, Elegant Trogons are similar to the rest of the family in vocalizations. For instance, when trogons are disturbed, they usually make "rattling" and "cackling" calls that can either be coupled with lateral flaring of the tail (as in the Resplendant Quetzal and White-tailed Trogon), or raising and lowering the tail (pumping; Cully 1986). This is seen in the Mexican, Citrolene, Black-throated, and Collared trogons (Allen 1944, Skutch 1942, 1948, 1956, 1959, Taylor 1994). In our study, the call rates of male Elegant Trogons were much greater than those of females during both years. Male call rates were also very similar between years. This pattern is consistent with the calling patterns of other trogon species; for example, Skutch (1942, 1948, 1959) reported that Mexican and Citrolene trogons call loudly all during their breeding seasons in Central America, and Taylor (1994) reported that Eared Quetzals (*Euptilotis neoxenus*) also call frequently and loudly during their breeding seasons in Arizona and Mexico.

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