

COMMENTARY

Polygyny in Tree Swallows: Response to R. E. Simmons

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In a recent commentary, Simmons (1985) presented three alternative hypotheses to explain the variation in mating of Tree Swallows (*Tachycineta bicolor*) that I attributed to facultative, resource defense polygyny (Quinney 1983). Herein, I respond to Simmons, show that my conclusions were justified, and show that none of the alternatives suggested by Simmons is appropriate for the Tree Swallows that I studied.

Simmons stated that there was not a critical resource that was both defendable and of differential quality available to the swallows because they did not defend feeding territories and had nest boxes of identical materials and dimensions. Therefore, he believed females had nothing to choose between and, thus, no polygyny threshold to cross. On the contrary, nest boxes provided a monopolizable resource by which males controlled access to females. Nest boxes at Sewage Lagoon were near abundant food compared with those 3.25 km distant at Backus Field, where the food supply was much poorer. I stated that second-mated females bred polygynously at Sewage Lagoon because they could occupy Sewage Lagoon sites *only by breeding with already-mated males*. I implied that the alternative for these females was to nest at Backus Field, where pairs were breeding and unoccupied nest boxes were available at the same time that birds were mating polygynously at the superior food site. I did not imply, as Simmons suggested, that no unoccupied boxes or unmated males were present at *either* location.

Simmons also stated that the Verner-Willson-Orians (VVO) model assumes that polygyny will evolve if a female mating with an already-mated male has a reproductive success equal to or greater than that of a female mating with a bachelor male. He ignored that the model also explicitly assumes that bachelor males occupy inferior territories (habitat) compared with mated males, and I repeat that the VVO model requires only that polygyny be advantageous to unmated females (Wittenberger 1976). Monogamous females at the superior food site were significantly more successful at fledging young than were polygynous females (due largely to the disappearance of eggs and young from nests shared by two females). This led Simmons to state that polygyny appeared maladaptive for females. However, polygynous females at the superior food site were *not* less successful than mo-

nogamous females breeding at the poorer food site at the same time. On average, there were 5 unoccupied nest boxes per year at Backus Field when second-mated females began egg laying at Sewage Lagoon. Monogamous Backus females breeding at the same time as second-mated Lagoon females fledged an average of 2.85 ± 0.43 offspring per female ($n = 20$) compared with 2.14 ± 0.32 offspring per female ($n = 14$) fledged by polygynous females ($t = 1.18$, $P > 0.20$).

Simmons mistakenly believed that my data did not distinguish between three alternative hypotheses that explain polygyny in certain species. The uncommon occurrence of bigamy at the superior food site effectively negates the advantage to female Tree Swallows of reduced fecundity by producing male offspring that receive important attributes from their fathers (Weatherhead and Robertson 1979, 1981). The male cheating hypothesis (Alatalo et al. 1981, 1982) is not applicable because male Tree Swallows cannot hide their "marital" status when mated with two females that share one nest box simultaneously. The desperation hypothesis described by Simmons (1983) "assumes that polygyny arises from a forced choice among females" because a lack of unmated males obliges females to breed with already-mated males. Pairs were breeding at the poorer food site, however, and unoccupied boxes were available there at the same time polygyny occurred at the superior food site. This indicates that males with nest boxes close to abundant food were in short supply, not males themselves or breeding opportunities in less favorable habitat. Ideally, the expected fitness of second-mated females must be compared with that of monogamous females breeding simultaneously to test the polygyny threshold model. Unfortunately, in 1980-1982 I could not distinguish second-mated females from those that were first to mate with the same male because the two females shared one nest box simultaneously and I did not band or color-mark them until most eggs were laid. However, the food supply and breeding performance of monogamous birds was superior at Sewage Lagoon compared with Backus Field. Polygyny occurred only at the superior food site, but pairs were breeding and unoccupied nest boxes were available at the poorer food site simultaneously with the occurrence of polygyny at the superior site. There was no significant difference in number of young fledged between polygynous females at the superior food site and concurrently breeding monogamous females at the poorer food site. Therefore, I concluded that Tree Swallows crossed a polygyny threshold.

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None of the alternatives offered by Simmons (1985) provides such an adequate explanation.

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EDITOR'S NOTE

It is the policy of *The Auk* to publish commentaries and the appropriate responses together whenever possible. We feel this maintains continuity in the discussion. In the present case the original commentary by Simmons appeared in January 1985 (*Auk* 102: 210-211). The delay in this case was in this office, and any inconvenience to readers is regretted.