ORNITOLOGIA NEOTROPICAL 14: 339–343, 2003

NESTING AND BREEDING BEHAVIOR OF THE PLAIN WREN (*THRYOTHORUS MODESTUS ZELEDONI*)

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Resumen. – Anidación y comportamiento reproductivo del Soterrey Chinchirigüi (*Thryothorus modestus zeledoni*). – Este estudio presenta información nueva sobre la ecología reproductiva del Soterrey Chinchirigüí (*Thryothorus modestus zeledoni*) de la región del Caribe en Costa Rica. Se presentan datos sobre tasas de anidación, éxito reproductivo, estructura del nido y comportamiento de las aves. Esta información incrementa considerablemente el conocimiento previo acerca de la anidación y comportamiento reproductivo de las especies de *Thryothorus,* y presenta diferencias importantes entre *T.m.zeledoni*, y otros estudios publicados sobre la subespecie del Pacífico *T.m. modestus.*

Abstract. – This study presents new information on the breeding ecology of the Plain or Canebrake Wren (*Thryothorus modestus zeledoni*) on the Caribbean slope of Costa Rica. From observations throughout the 2001 breeding season, data on nesting rates and breeding success, and well as on nest structure and the behavior of the birds, are compared with earlier studies. Dormitory nest building behavior is also reported in more detail than previously. This information adds considerably to previous knowledge of the nesting and breeding biology of *Thryothorus* wrens, and presents some distinct differences between *T. m. zeledoni*, and previously published studies on the Pacific slope subspecies, *T. m. modestus. Accepted 7 November 2002.*

Key words: Costa Rica, dormitory nest, eggs, Plain Wren, Canebrake Wren, reproductive success, *Thryothorus modestus modestus.*

INTRODUCTION

The genus *Thryothorus* consists of medium sized wrens that extend from northern South America into the United States. They are typical wrens, being superficially sexually monomorphic (though there may be some plumage differences discernible in the hand), socially monogamous and territorial. Their behavior is generally cryptic, the birds inhabiting thick scrub, marshland or forest, where they forage exclusively for invertebrates by gleaning from vegetation. Plain Wren (*T. modestus*) breeding behavior was first reported by Skutch (1940) who presented nesting observations that remain almost the only source of information for this species. Its range extends from southern Mexico to southern Panama, and in Costa Rica is considered as split into two subspecies, geographically separated by the mountains running down the centre of the country (Stiles & Skutch 1989). The pacific slope subspecies (*T. m. modestus*), retains the common name Plain Wren, but that on the Caribbean slope (*T. m. zeledoni*) is sometimes referred to as the Canebrake Wren (Ridgley & Gwynne 1989). Information on the ecology of the two is lacking, although a recent guide has presented them as separate species (Brewer 2001). Relatively little is known about the breeding behavior of *Thryothorus* wrens. This is probably partly because their nests are

often very hard to locate, being built in very dense vegetation, but research has also tended to focus on singing and more apparent breeding behaviors, rather than following nesting activity.

In common with several other wren species, *T. modestus* is known to build dormitory nests in which adults roost, but which are not involved in breeding (Stiles & Skutch 1989, Brewer 2001). Both males and females have been observed roosting in these simple structures, and observations on their construction and use shall also be described here, as the data add new information to previously published records.

STUDY SITE AND METHODS

Observations were carried out between March and August 2001 at La Suerte Biological Field Station in Límon, Costa Rica. The area contains fragmented forest, second growth and regenerating ex-pasture/marshes, which consist of large areas of unbroken tree/scrub cover as well as tall grass or reed growth. It is these areas of mixed tree/scrub, grass and marshland that *T. m. zeledoni* occupies, with most territories centred on one of the patches of marsh, and extending into the surrounding pasture.

The study population consisted of 21 pairs, all of which were caught and ringed at the beginning of the season. A combination of two plastic color rings and one metal numbered ring were used to provide unique combinations for each bird. This was particularly important in allowing recognition of the male and female of each pair when they were not singing (for details of duet structure see Mann *et. al.* submitted).

The breeding behavior of eight pairs of wrens was monitored to obtain information on breeding stage and reproductive success. Nests were located by observing the behavior of the birds, particularly the female, and then searching within a small area. Nests were checked every 3 days, and visits to the nest were timed for when it was certain that the female was off and foraging at least 10 m away. To minimise disturbance and the chance of affecting breeding success, nests were not visited any more frequently even though, as long as the female was not flushed off the nest, observer presence did not seem to affect the adult birds' behavior. Time in the vicinity of the nest was kept at a minimum and efforts made to ensure that vegetation was not moved out of place or bent. Insect repellent was not used on nest checking days, both to reduce possible harm done to the chicks by the chemicals, and to minimise any odour signals that might attract the interest of potential predators. As part of a genetic study into the breeding system, and to allow molecular sexing, feather samples were taken from chicks close to fledging, and eggs removed from abandoned nests. A nest was assumed abandoned when the birds had not been observed near it for at least a week, and when the female had either been observed going to roost elsewhere (incubating females always roosted in the nest), or beginning to build a new breeding nest. In the absence of bird remains or nest damage, nests and fledglings were assumed to have been predated when eggs or chicks disappeared entirely, and when the behaviour of the adult birds simultaneously changed massively from breeding to non-breeding activity patterns. Once nests were no longer in use, and if predators had not damaged them, measurements were taken of their dimensions and position, and the material used and the host plant type were recorded.

Observations were carried out on 8 pairs once every 2–3 days throughout the season to gather data on, amongst other things, nest visiting rates, nest building behavior, and behavior of the juveniles. Observation periods lasted for 75–90 min, with variables being

TABLE 1. Position measurements taken from a sample of seven nests, three of which were still intact after use, so that their dimensions could be measured. Host plants are those that the nests were actually constructed on, excluding other vegetation types forming the thicket.

Pair	Height above ground (m)	Depth from edge of cover (m)	Nest size (mm)			Host plant type
			Width	Depth	Height	
1	0.89	0.45				Vine on Urticaceae treelet
1	1.55	0.60	99	77	173	Citrus tree
1	0.65	0.53	106	67	160	Citrus tree
2	1.65	0.60	98	103	190	Citrus tree
6	1.12	1.53				Vines & ferns
6	0.98	0.95				Vines & ferns
7	0.99	1.70				Vines & ferns

recorded every minute. For repeated behavior patterns such as gathering nesting material or delivering food to nestlings, the frequency of performance within each minute was also recorded.

Dormitory nests were located either by observing the birds in the process of their construction, or by following the birds to roost. No active searches for dormitory nests were carried out except in situations where it was necessary to be sure that a dormitory nest was being used.

RESULTS AND DISCUSSION

During the season, 11 nests from six pairs were located. Of the eight pairs used for breeding studies, one did not attempt to breed, and another attempted once and then both adults disappeared from the area. As no new pair occupied the latter territory, and as the disappearance coincided with a breeding attempt (from behavioral observations, although no nest was located), it seems likely that the female, at least, was predated. Two other pairs also suffered predation of the female, both during incubation. One male went on to re-mate within 3 weeks of losing his first mate, but did not attempt to breed again. The other had not attracted another female by the end of the field season, which was more than 10 weeks post-predation.

Laying occurred in 10 of the 11 nests found, although not all clutches were completed, some suffering predation or abandonment during laying. Of the 20 eggs laid, 11 survived to hatching and two chicks survived to independence. Apart from five abandoned eggs (three nests), all the apparent predation occurred either on the nest or within a few days of fledging. This high rate of breeding failure appeared to be the case for the whole population as, of 13 other pairs not followed closely, only one reared a juvenile to independence. This suggests that my interference was not responsible for the breeding failures in the focal pairs.

Nest structure. Skutch (1940) first described breeding nests of *T. m. modestus*, referring to them as roughly globular, with a visor shielded side entrance, thick walled and constructed of grasses and weeds. This does, very approximately, match the nests of *T. m. zeledoni* found in this study, but these were distinctly ovoid, with the side entrance being at the top and the visor forming a slight downward pointing entrance tunnel. The entrance and its lip straddled a thin (1–2 cm) horizontal branch, and, as described in *T. modestus*, the nest was usually found within dense scrub or vine tangles (Stiles & Skutch 1989). This very

closely matches recent nest descriptions for *T. leucotis* and *T. rufalbus* (Ahumada 2001). Nests were lined, as previously reported by Skutch (1940), with seed down and feathers, which came from a variety of species. Table 1 shows the dimensions and position measurements taken from a sample of seven nests, as well as the plant type in which the nest was found. The tendency for the nests that were found to be near the edge of a patch of cover may be due to sampling. Indeed nests were far more likely to be located if close to the edge of cover, and those nests that were not found may well have been deeper in scrub patches.

Dormitory nests, of which 19 were found, were exactly as described by Skutch (1940): "a very flimsy construction, a roughly cylindrical pocket placed horizontally with the round entrance at one end".

Breeding behaviour. Only females are involved in building the breeding nest, although the male remains close to the female while she is gathering material. The nest is constructed over about three days, in several bursts of about 30 min of building activity each day. Clutch sizes of *T. m. zeledoni* matched the literature for *T. m. modestus* (Skutch 1940, Stiles & Skutch 1989): of 10 completed clutches, two were of three eggs, and seven of two. Differing from previous accounts, however, all of the eggs checked were clear pale blue, rather than pure white (Stiles & Skutch 1989). Incubation, at 14 days, was shorter in this study than the 18 days quoted by Skutch (1940), but time to fledging (leaving the nest) seemed to be similar: 14–15 days in *T. m. zeledoni*, 13 in *T. m. modestus* as reported by Skutch (1940).

Both members of a pair were involved in feeding the young as soon as they hatched, although the female continued to brood intermittently until the chicks were two days old. Once the juveniles fledged, they remained on or near the ground, within 5 m of the nest, for two days. The parents delivered food to them there, until they began to follow the adults as they foraged. Although juveniles did not seem capable of full flight when they left the nest, nests were always located on the edge of large patches of dense scrub, so they were able to move rapidly away from threat by hopping and fluttering through the vegetation. Fledglings may leave the nest before they can fly because of the immense threat posed by nest predators. Predators such as snakes, and coatis (*Nasua narica*) that can locate prey by scent, would be much more likely to find a nest with its associated droppings and parasites, than two juveniles moving through a scrub patch.

Dormitory nesting behavior. Males and females both build and sleep in dormitory nests, although females will roost in breeding nests before they commence incubation (Skutch 1940, pers. observ.). While not breeding, members of a pair usually have dormitory nests within 10 m of one another, and males would build dormitory nests within 10 m of the breeding nest within a day of the female starting to build. As these nests are much flimsier than breeding nests, they took only about 30 min to build, and males in particular appeared to build new nests as often as twice a week. Dormitory nests were built in a greater variety of sites than breeding nests, from tall grass about 0.6 m above the ground, to an exposed branch 4 m up a solitary 6-m tall tree. Apart from the two found in grass, all other adult dormitory nests were more exposed than any breeding nest.

Stiles & Skutch (1989) state that juvenile *T. modestus* may use nests of other species as dormitory nests, but this behavior was never observed in this study. However, one pair was twice observed building a dormitory nest together (both male and female gathering material and adding to the structure), and it was then used by their fledged but dependent juvenile. On all four occasions that this juvenile was observed to go to roost, it was lead

to the nest by the male, who, once the juvenile had entered, flew towards the female, duetted briefly and then went to roost itself. On another occasion, the same pair, jointly building a nest, presumably a juvenile dormitory nest, abandoned it with high rates of alarm calling when a Bronzed Cowbird (*Molothrus aeneus*) approached the nest with obvious interest. Cowbirds are brood parasites of some *Thryothorus* wrens (Ahumada 2001, Brewer 2001), and the response of the adult wrens appeared to suggest that Bronzed Cowbirds act as brood parasites of *T. m. zeledoni*. In July 2002, another pair were found to be rearing a juvenile Bronzed Cowbird, confirming the earlier prediction.

Conclusions. This paper, in addition to contributing to the information from earlier reports, has revealed some differences between these new observations on *T. m. zeledoni* and the published data on *T. m. modestus*. The differences in nest shape and egg color, although highly variable characteristics, add weight to the argument that the degree of difference between the two subspecies warrants further investigation. Until now, the proposed species split (Brewer 2001) has been based largely on morphometric differences, rather than behavioral or ecological ones. The issue needs further investigation, for example by comparative studies of the antiphonal duets of the two populations, or molecular studies to assess their genetic distance from one another.

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