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THE NEST AND NESTING ECOLOGY OF *ACROBATORNIS FONSECAI* (FURNARIIDAE), WITH IMPLICATIONS FOR INTRAFAMILIAL RELATIONSHIPS

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ABSTRACT.—Descriptions of the nest and nesting ecology of *Acrobatornis fonsecai* (Pink-legged Graveteiro), a newly described genus and species in the Furnariidae, are presented. Nests, constructed of twigs and sticks, are single-chambered, well-lined with mosses and leaves (one examined in detail), and situated in the canopy of tall trees. In October 1995, we located 131 nests in 72 trees at 54 sites. The average number of nests/tree was 1.8 with a maximum of five nests in a single tree; apparently only one nest/tree is active. "Extra" nests were often smaller than active nests, and at least sometimes had no entrance or chamber. We postulate that these nest-like structures represent dummy or cock nests to confuse predators or parasites (it certainly worked on us), and may serve as resource stores (i.e., construction materials and nest foundations). Brief observations indicated that immatures (probably offspring) help adults in nest construction, and may help feed food-begging juveniles. Comparison with other, possibly related, furnariids, suggests that nest architecture of *A. fonsecai* is most similar to that of the "stick-nesting" group of *Asthenes* canasteros, for which nests are relatively well known, but is also similar to some *Cranioleuca* spinetails and perhaps to the *Xenerpestes* graytails and the *Metopothrix* plushcrown, which are poorly known. Our data supplement the discussion of morphological, vocal, and behavioral comparisons of the same groups presented by Pacheco et al. (1996). We postulate that stick-nesting in Furnariidae arose in a pre-Andean, Chaco-Patagonian/Pantanal center, and provide some theories on the evolution of this behavior. *Received 23 April 1996, accepted 21 May 1996.*

RESUMO.—Descrição do ninho e dados ecológicos da nidificação de *Acrobatornis fonsecai* (Acrobata), um novo gênero e espécie de Furnariidae recentemente descrito são apresentados. Os ninhos, construídos de gravetos, possuem uma única câmara bem forrada com musgos e folhas (N = 1 examinado em detalhe), e são situados na copa de árvores altas. Em outubro de 1995 foram localizados 131 ninhos em 72 árvores em 54 pontos diferentes. O número médio de ninhos por árvore foi de 1,8, com um máximo de cinco ninhos em uma única árvore; aparentemente apenas um ninho por árvore é ativo. Os ninhos "extras" são geralmente menores do que os ninhos ativos e, ao menos às vezes, não apresentam entrada ou câmara. É postulado que estas estruturas representem "ninhos falsos" para confundir predadores ou parasitas (como aconteceu com os autores) ou, talvez, para servir como reserva de recursos (i.e., material de construção e "alicerce" de ninhos). Breves observações indicam que imaturos (provavelmente filhotes de uma ninhada anterior) ajudam adultos na construção do ninho e, talvez, colaborem na alimentação de jovens. Comparações com outros, possivelmente aparentados, furnarídeos, sugere que a arquitetura do ninho de *A.*

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fonsecai tenha mais semelhança com aqueles do grupo de *Asthenes* "construtores de ninhos de graveto," para o qual os ninhos são relativamente bem conhecidos, mas também apresenta similaridades com aqueles de algumas *Cranioleuca* e talvez com aqueles de *Xenerpestes* e *Metopothrix*, os quais são insuficientemente conhecidos. Os dados sobre o ninho e nidificação complementam a discussao de morfologia, vocalização e comportamento em comparação aos mesmos grupos conforme apresentados por Pacheco et al. (1996). É teorizado que a contrução de ninhos de gravetos em Furnariidae surgiu num período pré-andino no centro Chaco-Patagônia-pantanal, e são fornecidas algumas teorias sobre a evolução deste comportamento.

Nest architecture and placement have been considered important in judging systematic relationships in the Neotropical family Furnariidae (Vaurie 1971, 1980), and we concur that data on nests, at least insofar as definition of basic nest-type, are desirable in any analysis of intrafamilial relationships of this complex assemblage of birds. We are also in full agreement with Narosky et al. (1983) that caution regarding assumptions of relatedness based on current classifications or on nesting similarities must be maintained. Data on nests should be overlaid with as many other potentially informative data as possible. This report on the nest and nesting ecology of the recently discovered and described *Acrobatornis fonsecai* (Pink-legged Graveteiro; Pacheco, et al. 1996), a new genus and species in the Furnariidae, supplements the discussion of its relationships based on intrafamilial comparisons of morphology, vocalizations, and behavior presented by Pacheco et al. (1996). Distribution of *A. fonsecai* in the remnant lowland forest of southeastern Bahia, Brazil, was mapped by Pacheco et al. (1996; Fig. 4).

Description of the nest of Acrobatornis fonsecai.—As seen from the ground, the nest of *Acrobatornis fonsecai* is a globular, ovoid, or roughly rectangular structure of twigs and sticks, usually situated in a fork of branches, sometimes on top of a limb if angled less than about 30° above the horizontal, and inside the crown of a tall tree surrounded by or adjacent to other tall trees (Fig. 1). Because nests are generally conspicuous in treetops, sometimes in leafless trees, we located them easily with visual searches, mostly from roadsides. These nests may have been overlooked or ignored by the many observers who have traversed this region in the past because of their superficial similarity to nests of *Phacellodomus rufifrons* (Rufous-fronted Thornbird) which, however, typically builds much longer nests that hang in a vertical column from the periphery of isolated trees (Skutch 1969a, Thomas 1983). Like those of *A. fonsecai,* nests of thornbirds are also variable in shape and size, with some, probably unfinished, nests being constructed around upright branches or even thin tree trunks (Figs. 2, 3). Such nests are often smaller than normal, and similar in outward appearance to those of *A. fonsecai.*

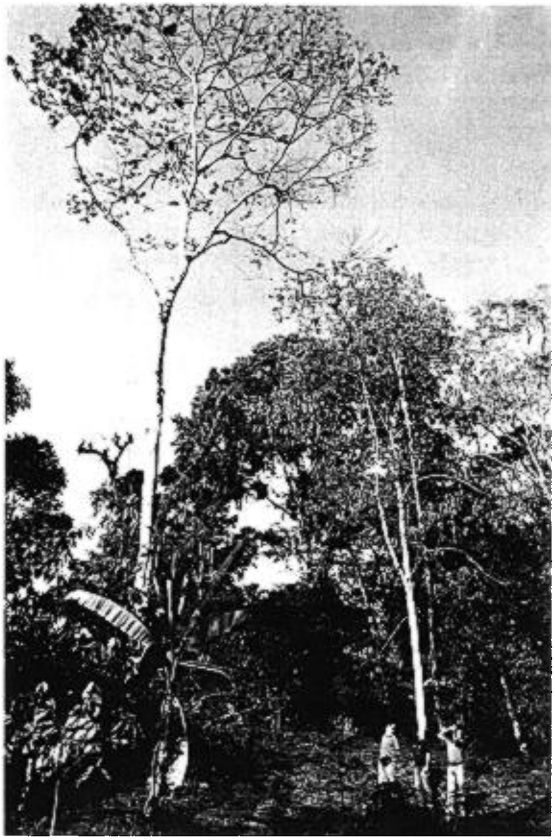

FIG. 1. Nest tree of *Acrobatornis fonsecai* at the edge of a mixed cocoa and banana plantation along a road near Arataca, Bahia. Most nest trees were in closer proximity to other tall trees. This *Senna multijuga* tree held five nests (see Fig. 2). Photos in this and other figures by Whitney.

Between 4 and 12 October 1995 we plotted a total of 131 nests of *Acrobatornis fonsecai* in 72 nest trees at 53 different sites in the Itabuna-Camacan region of southeastern Bahia (see Fig. 4 in Pacheco et al. [1996]). At 36 sites we observed only a single nest tree, at 16 sites, two nest trees, and 1 site had four trees with nests. At sites with more than one nest tree, we noted that these were generally less than about 100 m apart (unless on opposite sides of a road), but that they were rarely immediately adjacent. We do not know whether these separate trees were occupied by separate pairs of *A. fonsecai.* As can be deduced from the numbers above, individual trees usually held more than one nest. Of the

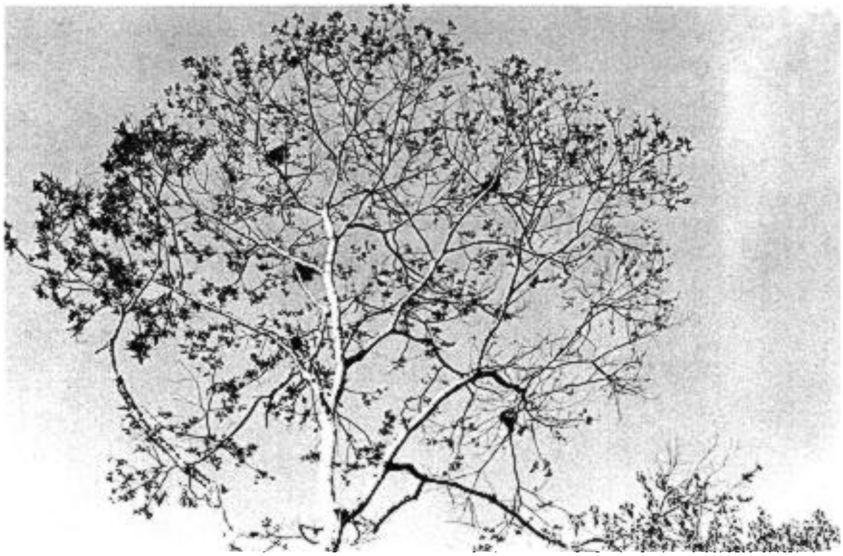

FIG. 2. Nest tree (*Senna multijuga*; see Fig. 1) of *Acrobatornis fonsecai* near Arataca, Bahia. Five nests are visible; we do not know if any were active in October 1995.

total of 72 nest trees we found in October, 31 (43%) held one nest, 27 (37%) held two nests, 11 (15%) held three nests, 2 held four nests, and 1 tree had five nests (Figs. 1, 2). The average number of nests/tree was 1.8. Nest-height varied considerably with tree height, but nests were always in the upper ⅓, usually in the upper ¼, of trees. Most nests were in excess of about 20 m above ground, and we estimated some as higher than 30 m.

Acrobatornis fonsecai builds nests mostly in mature trees of the family Leguminosae. Of the 72 nest trees located, 37 (51%) were members of the genera of Leguminosae mentioned in the "habitat" section of Pacheco et al. (1996; except that no nests were found in *Inga* species), 25 (35%) were not identified to family (but we suspect that many of these were male *Erythrina* species), and 10 were leafless trees (most of which we suspect were Leguminosae that had dropped their leaves). Leguminosae are among the dominant trees along roadsides over cocoa plantations in the range of *A. fonsecai*. This notwithstanding, we do not estimate that Leguminosae were so overwhelmingly more numerous than other tall trees that this could account for the fact that *A. fonsecai* nested mostly in Leguminosae. A more plausible explanation might be that the relatively open nature of the crowns of Leguminosae, and the fact that many had

FIG. 3. Nest tree of *Phacellodomus r. rufifrons* isolated in a field near Arataca, Bahia. Three nests are visible. Vertically oriented, pendant nest on lower left of tree is typical of an active nest. The two spherical, nest-like structures built around limbs are superficially similar to nests of *Acrobatornis*.

dropped at least some of their leaves in October, made it easier to see nests in them than in many other trees. To test this, we searched carefully in various kinds of trees shading cocoa and presented tape playback of *A. fonsecai* in parts of the serra Bonita where no nests were obvious. This effort resulted, however, in the location of only one nest tree, which turned out to be a *Schizolobium parahyba* (Leguminosae).

We were able to collect two of five nests in a *Senna multijuga* tree (Figs. 1, 2), neither of which was active. One of these, shown in Fig. 4, was damaged on removal from the tree, having lost a horizontal (roughly

FIG. 4. Nest of *Acrobatornis fonsecai* removed from nest tree shown in Figs. 1 and 2. This nest is missing the entrance tunnel, but shows the single, moss-lined chamber with its covering of twigs and sticks.

in the same line as the main axis of the nest) antechamber or entrance tunnel of undetermined length. We noted such entrance tunnels on all four active nests located, and numerous other nests, and concluded that it is a typical feature of active nests of *A. fonsecai.* Entrance tunnels were always toward one end of the nest, usually the lower end if the orientation of the nest was other than horizontal. Bearing in mind that description of most aspects of the external, stick-structure of this nest are rendered somewhat inaccurate because an undetermined number of sticks was lost, we present the following observations.

The outer layer, which was made up entirely of a dense weave (lining materials not visible) of sticks, none of which had thorns or spines, measured 18 cm long, about 24 cm in diameter (across the center of the chamber), and 18 cm tall or deep, not including sticks extending out irregularly from the main body. We dismantled the nest for more detailed analysis of its architecture. It contained 374 sticks (total mass 115 g) ranging 1 to 3 mm in diameter, which we separated into three classes by length: 10–15 cm (276; 74% of number, 50% of mass); 15–20 cm (75; 20% of number, 32% of mass); and over 20 cm (23; 6% of number, 18% of mass). The longest and thickest sticks, all of which were around the

FIG. 5. Nest-like structure of *Acrobatornis fonsecai*, built around the fork of a rather heavy branch, with no entrance or chamber, and with an *Epiphyllum* sp. cactus growing out of it. This structure contained several small ant nests. We suspect that such nest-like structures, or "extra nests" of *Acrobatornis* might serve as dummy or cock nests, or as stores of sticks and building foundations.

outside edge, were 27 cm long and 3 mm in diameter (N = 4). These sticks seemed light in weight relative to their length, varying from 0.8–1.2 g.; the heaviest equaled about 8.5% of the body weight of the bird (about 14 g.).

Beneath the external layer of sticks was a dense lining, 18 cm in diameter (thus 75% of the total width of the nest) and about 10 cm deep, with a mass of about 85 g. It was made up primarily (about 70%) of one type of moss, most of which appeared to be healthy and green when collected, and even when the nest was dismantled in February 1996. Also woven into this layer were rachises of decomposed leaves, which were more numerous around the incubation chamber. The chamber was quite rounded, and measured about 6 × 6 cm. Concentrated around it were pieces of *Tillandsia usneoides* lichens and *Marasmius* sp. fungus (see Sick 1957). One convoluted strand of the latter measured 90 cm. The chamber was surrounded with one type of leaf, which seemed to be a species of bamboo or bamboo-like grass. These leaves were folded or wrapped around the walls of the chamber, and averaged 12 cm long and about 2.5 cm wide. Some of the leaves had flecks of bird droppings on them. Because this nest was not active at the time of collection, it is possible that other birds or mammals had modified the interiormost lining materials.

Some nests are considerably longer (thus, more rectangular in profile) than others, which we suspect is owing mostly to variation in length of the entrance tunnel. This variation was not great relative to variation in the dimensions of the stick-nests of some other furnariids, as in some species of *Phacellodomus, Pseudoseisura,* and *Asthenes* species (pers. observ.), and we estimated the largest nest we saw to be about 45 cm long and of average circumference.

Our limited observations suggest that only one nest per tree is active at one time. This is reported to be the case with *Phacellodomus rufifrons,* which often has multiple nests in a single tree (Thomas 1983; Fig. 3). A variety of furnariids are known to build substantial stick-nests (Vaurie 1980, Narosky et al. 1983) that may persist with little external damage for months or even years (e.g., Skutch 1969, Nores and Nores 1994, various taxa pers. observ.). Thus, it seems likely that some of the "extra" nests of *Acrobatornis fonsecai* in multiple-nest trees are old nests.

Does Acrobatornis *build dummy or cock nests*?—A number of observations suggest that *A. fonsecai* may frequently construct one or more dummy or cock nests in trees with an active nest. Of two nests collected, the one described above appeared to be a true or complete nest, with a single, well-lined chamber occupying most internal space of the nest. It was not active when collected, but the fact that it was lined, and had traces of old bird droppings on some of the lining material, may indicate that it was at one time an incubation nest rather than a dormitory or dummy nest (Skutch 1969a). The other nest, although quite similar in overall size, shape, and external composition to the true nest, had no sign of an entrance or internal chamber; it was simply an oblong ball of sticks in a fork of a branch with one part of the branch through the middle of it, thus, not an old nest or a potential dormitory (Fig. 5). This nest had an epiphytic cactus (*Epiphyllum* sp.) growing out of it in several directions, which we suspect had formed the original foundation for construction, and there were several small ant nests within it. In the orientation in which it was in the tree (similar to that in Fig. 5), it measured 32 cm high, 22 cm wide, and 16 cm deep. Relative to the other nest, this chamberless one was constructed of shorter sticks.

A third nest from this same tree fell apart when detached from its supporting limb. We could not, therefore, examine it in detail, but we determined that it contained no lining, and suspect that it had no internal chamber. We noted on many occasions that "nests" in multi-nest trees showed appreciable variation in size, with the smallest ones often too small to have an internal chamber.

We have one more, rather fascinating observation relating to the possible deployment of dummy nests by *A. fonsecai.* We observed that one of four nests in a single tree near Camacan was actually a small, arboreal ant nest that had been decorated with twigs, resulting in its remarkable similarity to the other three *Acrobatornis* nests in the tree. It seemed to us that the sticks had been applied evenly and loosely in a horizontal orientation, after the ant nest was in place, and not left over after an interior occupation and outward construction by the ants that resulted in a uniform distribution of sticks. It also seems almost unimaginable to us that the birds had perceived that the ant nest was similar in size and shape to their own nests, then added some sticks to make it a dummy. It is perhaps more likely that they started adding twigs to the stable substrate of the ant nest, and built around it to some extent. Regardless of the birds' "intent," it fooled us for a few moments.

We suggest that the normal-sized but chamberless nest (Fig. 5), the "customized" ant nest, and small, probably chamberless nest-like structures in multi-nest trees, serve as dummies that may confuse predators as to the location of the true nest. Such a function has been attributed to dummy nests atop true nests constructed by pairs of Barred Waxbills (*Estrilda astrild*).

The multi-chambered stick nest of *Phacellodomus rufifrons* may contain dormitories and an incubation chamber or, if not the active nest, just dormitories, but they apparently always have internal chambers (Skutch 1969, Thomas 1983). Skutch (1969) believed that the complexity of nests of *P. rufifrons* made it difficult for predators (and even him) to locate the eggs and young within, and he proposed that complex construction was not only designed to confuse predators but also represented "an outlet for excess energy or a pastime."

Although neither of the above authors suggested that the multiplicity of nests of *P. rufifrons* in a single tree might confuse predators (or nest parasites like *Tapera naevia,* the Striped Cuckoo), looking for eggs, young, or adults, we suspect that this could contribute an important advantage for thornbirds' survivorship. The same reasoning applies equally well to explain the fact that *Acrobatornis fonsecai* often has more than one nest or nest-like structure in a tree. Even if non-active nests are assumed or eventually proven to be nests previously used by the birds as incubation chambers or dormitories, the fact remains that the birds repeatedly select the same tree for nest construction, one reasonable consequence of which is confusion of predators.

Another, non-exclusive, explanation for the construction of more than one nest in a single (presumably especially desirable) tree might be that "extra nests" represent resource stores (i.e., building materials and construction foundations). Sticks take a great deal of time and energy to gather and transport, and are a valuable enough resource that they are pirated by conspecifics in some species (Skutch 1969, Thomas 1983), or even other, unrelated species (pers. observ.). Furthermore, a wide variety of birds (conspecifics and others) are known to take advantage of old stick nests for construction materials or in their entirety, for nesting. We observed *Phacellodomus rufifrons* stealing sticks from a nest of *Acrobatornis fonsecai*; we noted no interspecific interaction, and we were unable to determine whether the nest of the latter was active at the time. Extra nests of *Acrobatornis,* many of which are smaller than active nests, might also secure foundation sites, ensuring the rapid construction of a nest should the primary one be lost or damaged. Thomas (1983) pointed out that the most difficult and energy-expensive stage of nest construction for *Phacellodomus rufifrons* was, by far, the establishment of a foundation.

Does Acrobatornis have "helper" offspring?—In early October, we observed many *Acrobatornis fonsecai* occupied principally with feeding young (see Pacheco et al. 1996), and we observed nest-building or maintenance behavior on only one occasion. Late on the afternoon of 11 October we saw three of four *A. fonsecai* remove sticks, one at a time, from a single nest in a densely foliated tree and carry them to another, slightly taller, leafless tree about 40 m away that contained two nests. Two adult birds and one of two brown, immature birds each carried one stick. The birds took sticks in the bill near the midpoint and, flying rather laboriously with the neck craned upwards, landed on the nest under construction. After clambering around on the top and sides of the nest for a moment with the stick, they deftly placed it in the upper exterior of the nest. We do not know how sticks are originally gathered (i.e., from the ground or by breaking them off trees) but, among furnariids, reuse of sticks from old nests or nests of other species has been reported by Skutch (1969) and Thomas (1983) for *Phacellodomus rufifrons,* and for *Pseudoseisura lophotes* by Nores and Nores (1994).

The observation of an immature bird involved in construction of a nest where adults were also building seems to be rare within the Furnariidae. Such "helping" behavior of presumed offspring has been previously reported for *Phacellodomus rufifrons* by Gilliard (1959) and Skutch (1969), although Thomas (1983) judged that the contribution of young thornbirds to nest construction and maintenance was "minimal." Additionally, Nores and Nores (1994) found that young *Pseudoseisura lophotes* performed a low level of helping in nest construction. Because few studies sufficiently detailed to reveal this kind of behavior have been conducted on furnariids, it is perhaps not surprising that there have been so few reports of young helping parents in construction of nests. In the case of *Acrobatornis fonsecai,* in which adults and immatures (juveniles, at least) are strikingly dichromatic, a most unusual condition in the Furnariidae, it would be relatively easy to conduct further observations to determine to what extent immatures (and, if color-banded, offspring) assist in nest-building or other activities.

Brown (1987) included *Phacellodomus rufifrons* in a list of species (his table 2.2) having helpers at the nest, citing Skutch (1969) and Thomas (1983). He defined a helper as "an individual that performs parent-like behavior toward young that are not genetically its own offspring." However, the accounts of helping in Skutch (1969) and Thomas (1983) document only that presumed young birds occasionally help parents in nest construction or maintenance. *Phacellodomus rufifrons,* as presently known, then, does not fit Brown's (1987) definition of a helper and should be removed from his table 2.2. Consequently, no member of Furnariidae is known to have a helper. On the morning of 11 October, Barth saw an immature (brown-plumaged) *Acrobatornis fonsecai* feed an insect to a food-begging juvenile being fed occasionally by a pair of adults. The four birds probably formed a family group. This observation of apparent helping (sensu Brown 1987; no pun intended) is intriguing, and merits further investigation.

The extra, possibly dummy nests of *Acrobatornis,* without entrances or chambers, if proven to be typical, might be a simpler, primitive form of false nest, with more complex, derived, dummy nests of some other birds (e.g., *Phacellodomus rufifrons,* some Troglodytidae) having evolved to serve as dormitories as well. It seems worthwhile to advance the possibility, in other words, that these nest-like structures represent the ancestral, least-complex state, the derived state of which is dummy nests that have false chambers that may or may not serve as dormitories. One apparent problem with this idea is that dummy nests have not been reported for other furnariids (or other suboscines?). We suggest, however, that extra thornbird nests within a single tree or, in the case of very large nests such as those of *Pseudoseisura* species, perhaps even in nearby trees, could be dummy nests (i.e., construction of dummy nests might have been misinterpreted to a large extent). Interestingly, neither Skutch (1969), Thomas (1983), or Nores and Nores (1994) advanced any explanation for multiple stick-nests in a tree, apparently assuming that these were all old nests or (in the case of Skutch) the result of excess energy. Another problem is that chamberless "nests," whether dummies or not, are apparently unreported in birds. Thus, the theory that *Acrobatornis fonsecai* might be using such structures as dummy nests or resource stores (as described earlier) is novel and, of course, untested.

Intrafamilial comparison of nest architecture.—Genera and species here compared with *Acrobatornis fonsecai* are the same discussed by Pacheco et al. (1996) for comparisons of morphology, vocalizations, and behavior.

Cranioleuca.—Nests (apparently only one per tree) are generally 25–30 cm in diameter, and are single-chambered, globular or conical masses of moss, grass, thin vines, and other flexible vegetation, in some species pendant from limbs at the periphery of trees, in others placed in a fork of branches or network of supporting vines and other vegetation. *Cranioleuca pyrrhophia* (Stripe-crowned Spinetail, of semiarid scrub and woodland in Bolivia, Paraguay, and northern Argentina), however, builds a nest of dry, thorny twigs bound with wool and vegetable fiber, and well-lined with lichen, or other soft material (Hoy *in* Vaurie 1980), or of soft vegetable material with a covering of sticks, in some cases spiny ones (Narosky et al. 1983). Reports differ regarding the location of the entrance (near the top or the bottom), and there is apparently no entrance tunnel.

Asthenes.—In comparing nests of *Asthenes* species with that of *Acrobatornis fonsecai,* we follow Pacheco et al. (1996) in limiting discussion to the "stick-nesting" group of *Asthenes.* Typical nests (usually one, occasionally two or three, per tree/shrub) are masses of twigs and sticks roughly 20–40 cm in diameter with single internal chambers built, for example, inside the crown of a tree or shrub, around the arms and trunk of columnar cacti, or within piles of rocks or in vegetation clinging to cliffsides. Some, such as *A. patagonica* (Patagonian Canastero), have entrance tunnels as long as the main body of the nest (Narosky et al. 1983; pers. observ.).

Thripophaga.—Both *T. macroura* (Striated Softtail) and *T. fusciceps* (Plain Softtail) construct roughly globular nests about 20 cm in diameter of small twigs and flexible vegetable material, such as grasses, rootlets, and thin vines. Nests are situated on thin limbs in the crowns of midstory and subcanopy trees, near the periphery of the tree, inside or at the edge of tall forest. We have seen only two nests of each species, however, and have examined none in detail.

Phacellodomus.—Nests of most species are similar to those of *P. rufifrons* shown in Fig. 3 and described in detail by Skutch (1969) and Thomas (1983). As is true of *Acrobatornis fonsecai,* there is often more than one nest/tree; active nests are usually situated at the periphery of trees, well below the crown and, as described earlier, differ from nests of *A. fonsecai* in a number of important respects.

Xenerpestes.—The two distinctive species in this genus are poorly known. Unfortunately, nests remain undescribed, although Ridgely and Gwynne (1989) suspected that a large stick-nest in eastern Panama belonged to the Double-banded Graytail (*X. minlosi*). Whitney observed a pair of *X. minlosi* hopping on a mass of twigs and sticks about 20 cm in diameter that he suspected was their nest, in the crown of a tall, foliated and flowering *Erythrina* tree at the Cana airstrip, Darién, Panama, in January 1992.

Metopothrix.—The sole member of *Metopothrix, M. aurantiacus* (Orange-fronted Plushcrown), like *Xenerpestes,* is poorly known. Nests were briefly described by Ridgely and Tudor (1994:128) as masses of sticks nearly 0.5 m across with the entrance at the side, built on lateral branches of trees from 4 to 20 m above ground, "not dissimilar in overall form from those of *Phacellodomus* thornbirds." These authors stated that Fraga (1992) had previously "described just such a nest" of *Metopothrix,* but Fraga's paper indicates that he saw birds carrying sticks only; he did not observe or describe a nest. *Metopothrix* nests are apparently considerably larger than those of *Acrobatornis* and are sometimes placed much nearer the ground; details of construction remain unknown.

Margarornis.—The only descriptions of the nest of any species appear to be those of Hilty and Brown (1986:367) and Fjeldså and Krabbe (1990: 384) for *M. squamiger* (Pearled Treerunner): "moss ball nest with side entrance" and "closed nest of moss, placed under a limb or a rock," respectively. In exterior architecture and general size and shape, nests of "stick-nesting" *Asthenes* are much like nests of *Acrobatornis fonsecai,* and appear to be the most similar in the family. *Cranioleuca pyrrhophia*'s construction of sticks around a well-lined chamber recalls that of *A. fonsecai.* This seems to be the only described stick-nest of that genus, although Whitney has recently discovered that *C. meulleri* (Scaled Spinetail) of the lower Amazon region, also builds an arboreal stick-nest (ms. in prep.). *Cranioleuca pyrrhophia* lives in habitats with little or no moss or flexible, herbaceous growth suitable for structural binding (or at least no reliable sources of such materials), which may have promoted stick-nesting (or the maintenance of it) in this species. We suspect, however, that the single-chambered, mossy globes of some of the other *Cranioleuca* species would be quite similar to nests of *Acrobatornis* if covered with a layer of sticks. Just as sticks are abundant and easily accessible in the habitat of *C. pyrrhophia,* they are relatively rare (i.e., soft, hard to break off, and decompose quickly on the ground) in the humid montane habitats of most of the other members of the genus. We await documentation and detailed descriptions of the nests of the two species of *Xenerpestes,* and of *Metopothrix aurantiacus.*

On the origin of stick-nesting in Furnariidae.—There appears to be no published discussion of the origin of stick-nesting in Furnariidae. We suspect that powerful environmental factors in place for prolonged periods would be required for evolution and establishment of such energetically expensive, sex-shared (i.e., nests are not sexually selected structures), nest architecture across the broad group of furnariids in which the behavior is prevalent today. During arid or semi-arid epochs, for example, there may have been few other construction materials available. Extended periods of winds, frequent violent weather, or cold would represent substantial selective forces. Similarly, fortified nests might have evolved to thwart large reptilian and avian predators and to withstand the shock of regular, incidental contact of nests and supporting vegetation by large vertebrates. Operative evolutionary mechanisms aside, we assume that the ancestral forms of stick-nesting furnariids arose in a southern, Chaco-Patagonian/Pantanal (in contemporary terms) distributional center during a pre-Andean epoch. In light of the overwhelming concentration and diversity of stick-nesting species surviving in this region of the continent today, origin of stick-nesting there is a reasonable assumption. This ancient center probably extended to interior northeastern Brazil, which today shares numerous forms with Chaco-northern Patagonia and the Pantanal (Short 1975 and numerous subsequent authors), including such stick-nesting furnariids as the Chotoy Spinetail (*Schoeniophylax phryganophila*), *Phacellodomus rufifrons,* Firewood-gatherer (*Anumbius annumbi*), and Rufous Cacholote (*Pseudoseisura cristata*). The contemporary distribution of stick-nesting *Asthenes* reaches its northeastern extreme only slightly farther south, in the serras of Minas Gerais (*A. luizae* Cipo Canastero). Certain successful forms apparently radiated widely (e.g., *Phacellodomus rufifrons* and *Anumbius,* which are still spreading, following forest clearance), and some, like stick-nesting *Asthenes,* speciated rapidly as they colonized a new, vertical stratum of Andean habitats to spread north to central Peru, where speciation seems relatively incipient. Forest-inhabiting *Cranioleuca* may have radiated following evolution of a more recent ancestral form in the forests that must have flourished with the condensation-precipitation (at least) resulting from Andean uplift. Such a sequence of events implies that stick-nesting is the primitive condition in this group of birds, at least.

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