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Nest, Eggs, and Nesting Behavior of the Gray Trembler (*Cinclocerthia gutturalis*) on St. Lucia, West Indies

Joshua B. LaPergola,[1,2,4] Jennifer L. Mortensen,[1,3] and Robert L. Curry[1]

ABSTRACT.—Few descriptions exist of the nesting behavior of the Gray Trembler (*Cinclocerthia gutturalis*), and the only nest description of this species seems incongruent with what is known about nesting behavior of other species of Mimidae. We report the first definitively described nest of the Gray Trembler in St. Lucia, West Indies in June–July 2007. We observed construction of, incubation at, and feeding of nestlings in an open-cup nest, similar in architecture to nests of other mimids, contradicting previous reports that Gray Trembler nests are domed, constructed of dried grass, and on top of palm (*Cocos nucifera*) trees. *Received 18 May 2010. Accepted 27 October 2010.*

Nesting biology is a basic component of the natural history of passerine birds. Nest structure can reflect phylogenetic relationships (Hansell 2000) and, along with nest-site selection, influence the likelihood of reproductive failure through mechanisms that include depredation and parasitism (Martin and Li 1992, Martin 1995). Locating and identifying nests of focal species—based on characteristics of the nest, the eggs, or both—are essential for monitoring reproductive parameters, including clutch size, hatching success, and fledgling production, which may affect population viability.

The passerine family Mimidae contains 34 species, including many species with only fragmentary data on nesting biology (Cody 2005). Recent molecular phylogenetic analyses support the presence of two clades within the family: (1) a monophyletic group comprising mockingbirds (*Mimus*) and thrashers (*Toxostoma* and *Oreoscoptes*), and (2) a monophyletic group containing Caribbean endemic thrashers and tremblers (*Ramphocinclus*, *Margarops*, *Allenia*, and *Cinclocerthia*), continental catbirds (*Dumetella* and *Melanoptila*), and Blue (*Melanotis caerulescens*) and Blue-and-white (*M. hypoleucus*) mockingbirds (Lovette and Rubenstein 2007). Members of the catbird and Caribbean thrasher clade are less represented in the scientific literature, in comparison to the well-studied mockingbird and continental thrasher clade, and lack detailed baseline natural history data with a few exceptions, e.g., *Dumetella carolinensis* (Cimprich and Moore 1995), *Margarops fuscatus* (Arendt 2006), and

[1] Department of Biology, Villanova University, 800 Lancaster Avenue, Villanova, PA 19085, USA.

[2] Current address: Department of Neurobiology and Behavior, Cornell University, Ithaca, NY 14853, USA.

[3] Current address: Department of Biology, Tufts University, Medford, MA 02155, USA.

[4] Corresponding author; e-mail:jbl96@cornell.edu

Ramphocinclus brachyurus (Temple et al. 2006, 2009).

The tremblers (*Cinclocerthia* spp.), in particular, are poorly known. Since their description in the mid-19th century, the Brown Trembler (*C. ruficauda*) and Gray Trembler (*C. gutturalis*) have been periodically lumped and split: the genus included at least two species in the late 19th century (Cory 1886), was monotypic in the early 20th (reviewed by Storer 1989), and split again later that century (AOU 1991). Recent morphological (Storer 1989) and molecular (Hunt et al. 2001) phylogenetic analyses support recognition of two distinct trembler species. Presently, the Martinique and St. Lucia populations are recognized as Gray Trembler and all other Lesser Antillean island populations are recognized as Brown Trembler (AOU 1998, Cody 2005). Only two studies of Brown Trembler natural history exist, both from Dominica: Zusi (1969) investigated feeding ecology and Markowsky et al. (1994) studied the function of the species' namesake trembling wing display. No formal studies have examined Gray Trembler behavior and/or ecology, and we suggest that published descriptions of the nest and eggs of this species are suspect.

Nearly all mimids are known to construct open-cup nests with a few exceptions (Cody 2005). Outliers include Sage (*Oreoscoptes montanus*) and Brown (*Toxostoma rufum*) thrashers which are occasional ground-nesters (Cody 2005), cavity-nesting Pearly-eyed Thrasher (*Margarops fuscatus*) (Arendt 2006) and, according to published accounts, Gray Trembler. Cody (2005:481) and Keith (1997:108) describe Gray Trembler nests as ''domed'' with both nest descriptions based on Danforth (1935:74), who reported a St. Lucian Gray Trembler nest as, ''a domed structure made of dry grasses, with the entrance at the side'' containing eggs (not described). Danforth's second-hand account was based on a description recounted by a resident of St. Lucia. In contrast, a ''cup-shaped'' Brown Trembler nest sent from Dominica was described by Bond (1941:372). Quoting his correspondent, the nest was ''situated in a fairly high coconut palm at the base of a frond, in the little hollow where it grew out of the trunk''; and ''although a nest, similarly situated, was found in St. Lucia (*Cinclocerthia ruficauda macrorhyncha*), the usual nesting site of this species would seem to be in the cavity of a tree or in the hollow stump of a tree-fern.'' Whether Bond or another person observed the nest on St. Lucia is unclear. Bond's (1971:170) field guide reiterated that Brown Tremblers (considering, at the time, Gray Tremblers as conspecific) nest ''in a cavity of a tree or tree fern, or at the base of a palm frond.''

A source for description of Gray Trembler eggs is also ambiguous. Bond (1971:170) described the eggs of ''Trembler'' as ''greenish-blue'' with a clutch size of 2–3 without specifying a source. Subsequent authors (e.g., Raffaele et al. 1998, Cody 2005) appear to have applied Bond's description to the eggs of both Gray and Brown tremblers, although Bond did not distinguish between the species.

Our objective is to report unequivocal descriptions of the nest structure and eggs of a Gray Trembler on St. Lucia, West Indies documented by photographs. We also discuss the validity of prior reports of the nesting biology of this species and its sister taxon, the Brown Trembler.

STUDY AREA

Our observation of a Gray Trembler nest occurred during study of the White-breasted Thrasher (*Ramphocinclus brachyurus*) within the Mandelé Range, a 680-ha fragment of regenerated dry forest on the east coast of St. Lucia, West Indies between the towns of Dennery and Praslin (Anthony and Dornelly 2008). The vegetation consists of littoral woodland and scrub species, transitioning into deciduous tropical dry forest away from the coast, and interspersed with subsistence agriculture and charcoal pit clearings (Temple 2005). A large portion of the Mandelé Range is currently being developed into a multi-use resort, resulting in dry forest destruction and landscape fragmentation (Mortensen 2009). The Gray Trembler nest observed was in a 47.6-ha forested plot on the development property.

OBSERVATIONS

Nesting Phenology.—We observed a Gray Trembler carrying a stick to the top of an understory tree ~15 m from a forest edge, adding the stick to a nest already under construction at 0850 hrs on 24 June 2007; the nest possessed a well-formed cup by 27 June 2007. We observed (using a digital video camera attached to a long stick) three eggs in the nest on 2 July 2007. Later that day, we observed an adult Gray Trembler incubating the eggs. The last day of egg observation was 13 July 2007, and the first

nestling observation was 16 July 2007 with no checks performed during the interim. We estimated from size and appearance that the trembler nestlings hatched on 15 July 2007, based on our experience observing >100 nesting attempts by the closely related White-breasted Thrasher. Thus, the incubation period of this nest was ~14 days. The last day we observed nestlings was 25 July, and the nest was empty on 30 July 2007. The nestling stage was a minimum of 11 days if the nestlings hatched on the date we estimated. However, we saw no evidence of fledging (i.e., we did not hear fledglings calling from outside the nest nor observe any adult trembler behavior suggesting that fledglings were in the immediate vicinity of the nest). The trembler nest was possibly depredated, given the high rate of failure for the open-cup and similarly placed White-breasted Thrasher nests in the same habitat (Mortensen 2009).

We observed two Gray Trembler fledglings at different locations within the study site on 27 and 28 June 2007. If we assume a nesting cycle of ~25 days (likely an underestimate due to uncertainty about clutch initiation date, hatching date, and date of failure/fledging), the known Gray Trembler breeding season extends, at least, from the beginning of June until the end of July.

Nest Description.—The Gray Trembler had a bulky, open-cup, not domed, nest (Fig. 1A, B). The cup of the nest consisted mostly of dead leaves and, to a lesser extent, thin twigs, and lacked the cleanly woven cup-structure of rootlets and other plant fibers typical of some other members of the catbird and Caribbean thrasher clade (RLC, pers. obs.). The outer portion of the nest consisted of larger twigs with dead leaves between the twigs surrounding the cup. The nest was in the forking branches just below the top of the crown in a ~4.5-m tall *Myrcia deflexa* (Myrtaceae) tree.

Eggs, Hatching Success, and Brood Reduction.—The Gray Trembler nest contained three light greenish-blue eggs (Fig. 1B), nearly identical in appearance to eggs of other members of the catbird and Caribbean thrasher clade, especially to those of the White-breasted Thrasher (JBL, pers. obs.). All three eggs hatched. One of the three nestlings disappeared from the nest between 23 and 25 July 2007, but the parents continued to feed the remaining two nestlings.

We used two still-frames from one of our videos and morphometric data from the literature to estimate sizes of the three eggs. Storer (1989) reported a mean beak from nostril length of 31.38 mm for female St. Lucian Gray Trembler. We used this value and ImageJ (Abramoff et al. 2004) to estimate the length of a small stick in the nest visible in a still-frame with a Gray Trembler, which we assumed to be female, incubating (Fig. 1A). We used this reference to estimate the length and width of the three eggs in another still-frame. Estimated dimensions (length × width) of the three eggs were 19.37 × 16.73 mm, 21.32 × 16.63 mm, and 19.91 × 15.61 mm, yielding mean (± SD) length of 20.20 ± 1.01 mm and width of 16.32 ± 0.62 mm. However, these estimates have limited accuracy because of the assumptions inherent in our methodology.

Parental Behavior.—Parents fed the nestlings a combination of arthropods, small vertebrates, and fruit. Specifically identified food items included centipedes (*Scolopendra* spp.) and dwarf geckos (*Sphaerodactylus* spp.). We did not band any adult tremblers near the active nest, and we observed no more than two adults concurrently in the vicinity of the nest. One trembler, on more than one occasion, flew at and pecked the video camera. However, even with the camera positioned <1 m from the nest, at least one adult continued to incubate during the egg stage and provision chicks during the nestling stage.

DISCUSSION

Our observations of St. Lucian Gray Trembler nesting biology question the accuracy of historical nest descriptions, while highlighting the necessity of rigor in field studies of avian reproduction. We propose two reasons for the discrepancy between our observations and previously published Gray Trembler nest descriptions: (1) initial descriptions of a Gray Trembler's nest were inaccurate and open-cup nests are typical for the species, or (2) the disparity between accounts reflects natural variation in the species, as recently observed in another Caribbean mimid, the Black Catbird (*Melanoptila glabrirostris*), which can nest (a) in open, cavity-like depressions in dead or living trees, (b) between peeling bark and tree trunks, and (c) in typical, mimid open-cup nests in branches (JBL, unpubl. data). Some variation in nest structure exists among and within species in the Mimidae, including Sage and Brown thrashers, species that occasionally nest on the ground (Cody 2005), and Pearly-eyed Thrasher, which often nests in secondary cavities (Arendt 2006). However, construction of a domed nest for Gray

FIG. 1. Gray Trembler nest on St. Lucia. (A) Adult trembler incubating. (B) Eggs and nest structure visible between incubation bouts (photographs by J. B. LaPergola).

Tremblers would suggest a radical departure from the simpler open-cup nest typical of most mimids. We suggest Danforth's (1935) original second-hand description may have resulted from misidentification of the owners of the nest in question. Resident species on St. Lucia that build domed or otherwise covered nests include St. Lucia Black Finch (*Melanospiza richardsoni*), Lesser Antillean Bullfinch (*Loxigilla noctis*), Black-faced Grassquit (*Tiaris bicolor*), Antillean Euphonia (*Euphonia musica*), Bananaquit (*Coereba flaveola*), and St. Lucia Oriole (*Icterus laudabilis*) (Keith 1997).

Our observations establish unequivocally the color (greenish-blue) of Gray Trembler eggs, but the accuracy of our estimates of egg dimensions is questionable. Our length and width estimates are smaller than those for Brown Trembler (*C. ruficauda ruficauda*) eggs from Dominica (length: 25.91 ± 0.93 mm and width: 19.49 ± 0.08 mm; $n = 3$ eggs; from the collection at the Western Foundation of Vertebrate Zoology, catalogue number 120,066; René Corado, pers. comm.). Adult St. Lucian Gray Tremblers are on average larger than Dominican Brown Tremblers (Storer 1989), which suggests our measurements under-

estimate actual Gray Trembler egg size because egg mass (and, thus, egg size) correlates with adult body mass in passerines (Martin et al. 2006). However, to our knowledge, the Gray Trembler egg dimensions we present represent the only available for the species and offer a basis for comparison with any egg dimension data collected for Gray Tremblers in the future.

Our description of the Gray Trembler's nest stresses the importance of accurate data for conservation efforts. The similarity in physical appearance of the observed nest and eggs of the Gray Trembler on St. Lucia, a species of least concern (BirdLifeInternational 2009), to the nests and eggs of its endangered relative, the White-breasted Thrasher, suggests nests containing eggs cannot be attributed to one or the other of these species without identifying the birds attending the nest.

The Gray Trembler is not presently considered at risk, but it experiences similar extrinsic and intrinsic conditions as other species restricted to islands. Island endemics, compared with species having continental ranges, comprise a disproportionately large percentage of threatened and endangered avifauna (Temple 1985). Gathering basic natural history data for the trembler and other poorly known species can inform management and help avert conservation problems. For example, the White-breasted Thrasher was recently discovered to be a facultative cooperative breeder with three or more individuals contributing care at many nests (Temple et al. 2006). This social system, which is well known in several other mimids (e.g., Galápagos mockingbirds, *Nesomimus* spp.; Curry and Grant 1990), can strongly influence effective population size and population persistence. Whether helpers are present at *Cinclocerthia* nests remains unknown. We hope the accurate, unequivocal nest and egg descriptions provided here will facilitate future study and clarify details of the Gray Trembler's natural history.

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LITERATURE CITED

ABRAMOFF, M. D., P. J. MAGELHAES, AND S. J. RAM. 2004. Image processing with ImageJ. Biophotonics International 11:36–42.

AMERICAN ORNITHOLOGISTS' UNION (AOU). 1991. Thirty-eighth supplement to the American Ornithologists' Union Check-list of North American birds. Auk 108:750–754.

AMERICAN ORNITHOLOGISTS' UNION (AOU). 1998. Checklist of North American birds. Seventh Edition. American Ornithologists' Union, Washington, D.C., USA.

ANTHONY, D. AND A. DORNELLY. 2008. St. Lucia *in* Important Bird Areas in the Caribbean: key sites for conservation (D. C. Wege and V. Anadon-Irizarry, Editors). BirdLife International, London, United Kingdom.

ARENDT, W. J. 2006. Adaptations of an avian supertramp: distribution, ecology, and life history of the Pearly-eyed Thrasher (*Margarops fuscatus*). USDA, Forest Service, General Technical Report 27. International Institute of Tropical Forestry, San Juan, Puerto Rico.

BIRDLIFEINTERNATIONAL. 2009. *Cinclocerthia gutturalis in* IUCN 2010. IUCN Red List of threatened species. Version 2010.3. IUCN, Gland, Switzerland. www.iucnredlist.org

BOND, J. 1941. Nidification of the birds of Dominica, B. W. I. Auk 58:364–375.

BOND, J. 1971. A field guide to birds of the West Indies. Second Edition. Houghton Mifflin, Boston, Massachusetts, USA.

CIMPRICH, D. A. AND F. R. MOORE. 1995. Gray Catbird (*Dumetella carolinensis*). The birds of North America. Number 167.

CODY, M. 2005. Family Mimidae (mockingbirds and thrashers). Pages 448–495 *in* Handbook of the birds of the world, Volume 10. Cuckoo-shrikes to thrushes (J. del Hoyo, A. Elliott, and D. A. Christie, Editors). Lynx Edicions, Barcelona, Spain.

CORY, C. B. 1886. The birds of the West Indies, including the Bahama Islands, the Greater and the Lesser Antilles, excepting the islands of Tobago and Trinidad. Auk 3:1–59.

CURRY, R. L. AND P. R. GRANT. 1990. Galápagos mockingbirds: territorial cooperative breeding in a climatically variable environment. Pages 290–331 *in* Cooperative breeding in birds: long-term studies of ecology and behavior (P. B. Stacey and W. D. Koenig, Editors). Cambridge University Press, Cambridge, United Kingdom.

DANFORTH, S. T. 1935. The birds of Saint Lucia. University of Puerto Rico, Río Pedras, Puerto Rico.

HANSELL, M. 2000. Bird nests and construction behaviour. Cambridge University Press, Cambridge, United Kingdom.

HUNT, J. S., E. BERMINGHAM, AND R. E. RICKLEFS. 2001. The molecular systematics and biogeography of Antillean thrashers, tremblers, and mockingbirds (Aves: Mimidae). Auk 118:35–55.

KEITH, A. R. 1997. The birds of St. Lucia. British Ornithologists' Union, Tring, United Kingdom.

LOVETTE, I. J. AND D. R. RUBENSTEIN. 2007. A comprehensive molecular phylogeny of the starlings (Aves: Sturnidae) and mockingbirds (Aves: Mimidae): congruent mtDNA and nuclear trees for a cosmopolitan avian radiation. Molecular Phylogenetics and Evolution 44:1031–1056.

MARKOWSKY, J. K., W. GLANZA, AND M. HUNTER. 1994. Why do Brown Tremblers tremble? Journal of Field Ornithology 65:247–249.

MARTIN, T. E. 1995. Avian life history evolution in relation to nest sites, nest predation, and food. Ecological Monographs 65:101–127.

MARTIN, T. E. AND P. LI. 1992. Life history traits of open- vs. cavity-nesting birds. Ecology 73:579–592.

MARTIN, T. E., R. D. BASSAR, S. K. BASSAR, J. J. FONTAINE, P. LLOYD, H. A. MATHEWSON, A. M. NIKLISON, AND A. CHALFOUN. 2006. Life-history and ecological correlates of geographic variation in egg and clutch mass among passerine species. Evolution 60:390–398.

MORTENSEN, J. L. 2009. Short-term behavioral and demographic responses of the White-breasted Thrasher (*Ramphocinclus brachyurus*) to habitat loss and fragmentation. Thesis. Villanova University, Villanova, Pennsylvania, USA.

RAFFAELE, H., J. WILEY, O. GARRIDO, A. KEITH, AND J. RAFFAELE. 1998. A guide to the birds of the West Indies. Princeton University Press, Princeton, New Jersey, USA.

STORER, R. W. 1989. Geographic variation and sexual dimorphism in the tremblers (*Cinclocerthia*) and White-breasted Thrasher (*Ramphocinclus*). Auk 106:249–258.

TEMPLE, H. 2005. Ecology, cooperative breeding and conservation of the White-breasted Thrasher *Ramphocinclus brachyurus*. Dissertation. University of Cambridge, Cambridge, United Kingdom.

TEMPLE, H. J., J. I. HOFFMAN, AND W. AMOS. 2006. Dispersal, philopatry and intergroup relatedness: fine-scale genetic structure in the White-breasted Thrasher, *Ramphocinclus brachyurus*. Molecular Ecology 15:3449–3458.

TEMPLE, H. J., J. I. HOFFMAN, AND W. W. AMOS. 2009. Group structure, mating system and extra-group paternity in the co-operatively breeding White-breasted Thrasher *Ramphocinclus brachyurus*. Ibis 151:99–112.

TEMPLE, S. A. 1985. Why endemic island birds are so vulnerable to extinction. Pages 3–6 *in* Bird conservation 2 (S. A. Temple, Editor). University of Wisconsin Press, Madison, USA.

ZUSI, R. L. 1969. Ecology and adaptations of the Trembler on the island of Dominica. Living Bird 8:137–164.