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Current status of the Endangered White-breasted Thrasher (*Ramphocinclus brachyurus*), a dry forest songbird endemic to Saint Lucia and Martinique

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Abstract The Eastern Caribbean islands of Martinique and Saint Lucia are home to the Endangered White-breasted Thrasher (*Ramphocinclus brachyurus brachyurus* in Martinique and *R. b. sanctaeluciae* in Saint Lucia). This species is among the most threatened of Caribbean birds, with fewer than 1,500 individuals range-wide. Here we review current research on its distribution, demography, behavior, and population size, as well as ongoing threats and conservation work. The thrasher is restricted to three areas of dry forest within its two-island extent: the Caravelle Peninsula in Martinique, and its Saint Lucia Iyanola and Mandelé ranges. On both islands, the species was once more widespread and abundant than it is today, though by the early 20th century, it was described as "a very rare bird" by the ornithologist James Bond. The Saint Lucia Mandelé range, discovered in the mid-1990s, now holds the largest extant population for the species, supporting almost 75% of the global population. Recent extensive fieldwork in this range established that the thrasher has relatively low nesting success and high adult survival, a pattern seen in many tropical birds. This work also documented the unusual breeding behavior of the species, cooperative breeding, whereby some individuals delay dispersal and breeding to help raise non-descendant kin. A likely consequence of this behavior is short dispersal distances; for example, there is no evidence that individuals move between islands or between the two ranges in Saint Lucia that are separated by only 3 km. A lack of gene flow has consequences for conservation planning and for species limits reassessment. The greatest threats to the White-breasted Thrasher are habitat loss and fragmentation, habitat degradation, and pressure from non-native mammalian predators. This first threat is the most acute in Saint Lucia, where there is a lack of protected habitat and ongoing habitat loss, and the last is the most acute in Martinique, where 50% of the species' range has been formally protected since the 1970s. These threats recently motivated the creation of the first conservation plan for the Saint Lucia subspecies.

Keywords Caribbean, habitat loss, island, *Ramphocinclus brachyurus*, threatened species, tropical birds, White-breasted Thrasher

Resumen Estado actual de *Ramphocinclus brachyurus*, paseriforme endémico y En Peligro del bosque seco de Santa Lucia y Martinica—Las islas de Martinica y Santa Lucia, del Caribe Oriental, son el hogar del ave En Peligro *Ramphocinclus brachyurus* (*R. b. brachyurus* en Martinica y *R. b. sanctaeluciae* en Santa Lucia). Esta especie está entre las más amenazadas de las aves caribeñas, con menos de 1.500 individuos en todo su rango de distribución. Revisamos las investigaciones actuales que existen sobre su distribución, demografía, conducta y tamaño poblacional, así como las amenazas actuales y el trabajo de conservación. Esta especie está restringida a tres áreas de bosque seco dentro de su rango de distribución en las dos islas: la península de Caravelle en Martinica y las regiones de Iyanola y Mandelé en Santa Lucia. En ambas islas, la especie fue más abundante y tuvo una distribución más amplia que la que se conoce hoy en día; aunque a principios del siglo 20, el ornitólogo James Bond la describió como "un ave muy rara". La region de Mandelé en Santa Lucia, descubierta a mediados de los 90, contiene actualmente la población más grande de esta especie, soportando casi el 75% del estimado global. Un amplio y reciente trabajo de campo en esta zona comprobó que esta especie tiene un éxito de nidificación relativamente bajo y una alta supervivencia adulta, un patrón visto en muchas especies de aves tropicales. Este trabajo también documentó la inusual conducta de cría de esta especie, la cría cooperativa, donde algunos individuos demoran la dispersión y la cría para ayudar en la cría de descendientes no emparentados. Una probable consecuencia de esta conducta son distancias de dispersión cortas; por ejemplo, no existe evidencia de que los individuos se muevan entre islas o entre las dos regiones de Santa Lucia que están separadas por sólo 3 km. La ausencia de flujo genético tiene consecuencias para los planes de conservación y la revaluación de los límites para esta especie. Las mayores amenazas para el *Ramphocinclus brachyurus* son la pérdida de hábitat, la fragmentación y la

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degradación del hábitat y la presión por parte de mamíferos depredadores no nativos. La primera amenaza es la más grave en Santa Lucia, donde hay una falta de hábitat protegido y una constante pérdida de hábitat; y la más grave en Martinica es la última, donde el 50% del rango de distribución de la especie ha sido protegido formalmente desde la década de los 70. Estas amenazas motivaron recientemente la creación del primer plan de conservación para la subespecie de Santa Lucia.

Palabras clave aves tropicales, Caribe, especie amenazada, isla, pérdida de hábitat, *Ramphocinclus brachyurus*

Résumé Situation actuelle du Moqueur gorge-blanche (*Ramphocinclus brachyurus*), espèce En danger endémique des forêts sèches de Sainte-Lucie et de la Martinique—Les îles de la Martinique et de Sainte-Lucie dans l'est de la Caraïbe abritent une espèce En danger, le Moqueur gorge-blanche (*Ramphocinclus brachyurus brachyurus* en Martinique et *R. b. sanctaeluciae* à Sainte-Lucie). Cette espèce est parmi les oiseaux caribéens les plus menacés, avec moins de 1.500 individus dans l'ensemble de son aire de répartition mondiale. Nous examinons ici les recherches actuelles sur la répartition, la démographie, le comportement et la taille de la population, ainsi que les menaces actuelles et les travaux de conservation en cours. Le Moqueur gorge-blanche est limité à trois zones de forêt sèche sur les deux îles : la péninsule de la Caravelle en Martinique et les zones de Iyanola et de Mandelé à Sainte-Lucie. L'espèce a été autrefois plus répandue et plus abondante sur les deux îles qu'elle ne l'est aujourd'hui, mais au début du XX^{e} siècle, elle était décrite comme « un oiseau très rare » par l'ornithologue James Bond. Son occupation de la zone de Mandelé à Sainte-Lucie, découverte au milieu des années 1990, comprend actuellement la plus grande population existante, avec près de 75% de la population mondiale. Le travail de terrain mené récemment sur cette zone a montré que le Moqueur gorge-blanche présente un succès de reproduction relativement bas et une survie élevée des adultes, un schéma observé chez de nombreux oiseaux tropicaux. Ce travail a également documenté le comportement de reproduction inhabituel de l'espèce, l'élevage coopératif, dans lequel certains individus retardent leur dispersion et leur reproduction pour aider à l'élevage de jeunes qui ne sont pas leurs descendants. Une conséquence probable de ce comportement est la faible distance de dispersion ; il n'y a actuellement aucune preuve que les individus se déplacent entre les îles ou entre les deux zones d'occupation à Sainte-Lucie, qui ne sont séparées que de 3 km. L'absence de flux génétique a des conséquences pour la planification de la conservation et pour la réévaluation des limites de l'espèce. Les plus fortes menaces pesant sur le Moqueur gorge-blanche sont d'une part la perte, la fragmentation et la dégradation de ses habitats et d'autre part la pression des mammifères prédateurs non indigènes. Cette première menace est la plus grave à Sainte-Lucie où il y a actuellement un manque de protection et une perte de ses habitats, et la seconde est la plus sévère en Martinique où 50% de l'aire de répartition de l'espèce est formellement protégée depuis les années 1970. Ces menaces ont récemment motivé la création du premier plan de conservation de la sous-espèce de Sainte-Lucie.

Mots clés Caraïbe, espèces menacées, île, Moqueur gorge-blanche, oiseaux tropicaux, perte d'habitat, *Ramphocinclus brachyurus*

The White-breasted Thrasher (*Ramphocinclus brachyurus*; Fig. 1) has been referred to as one of the highest priority avian species for research and conservation in the Caribbean (Stotz *et al.* 1996). This non-migratory songbird is endemic to Martinique (where it is known as Moqueur Gorge Blanche) and Saint Lucia (where it is known as the Gòj Blan—or Gorge Blanc in older spellings). It has subspecies status on each island (*R. b. brachyurus* in Martinique and *R. b. sanctaeluciae* in Saint Lucia) and it exists in three populations within this two-island extent (Fig. 2; BirdLife International 2017). This extremely small and increasingly fragmented range is the justification for the species' IUCN status of Endangered (BirdLife International 2017). The call for White-breasted Thrasher research and conservation has been answered in part by field studies of the species' geographic range (Temple 2005), habitat requirements (Temple 2005), demography (Temple 2005, Mortensen 2009, Mortensen and Reed 2016), behavior (Temple *et al.* 2006, 2009, Mortensen 2009, Gros-Desormeaux *et al.* 2015), and population size (Temple 2005, Young *et al.* 2010); modeling of habitat suitability (White *et al.* 2012, Sass *et al.* 2017) and extinction risk (Mortensen and Reed 2016); and the completion of the first conservation plan for the Saint Lucia subspecies (Felix *et al.* 2014). Here we review the existing body of work on the White-breasted Thrasher, and discuss anticipated environmental changes and conservation objectives with a particular focus on the Saint Lucia subspecies.

Fig. 1. White-breasted Thrasher adult in the Mandelé range, Saint Lucia. Photo used with permission of Gunnar Kramer.

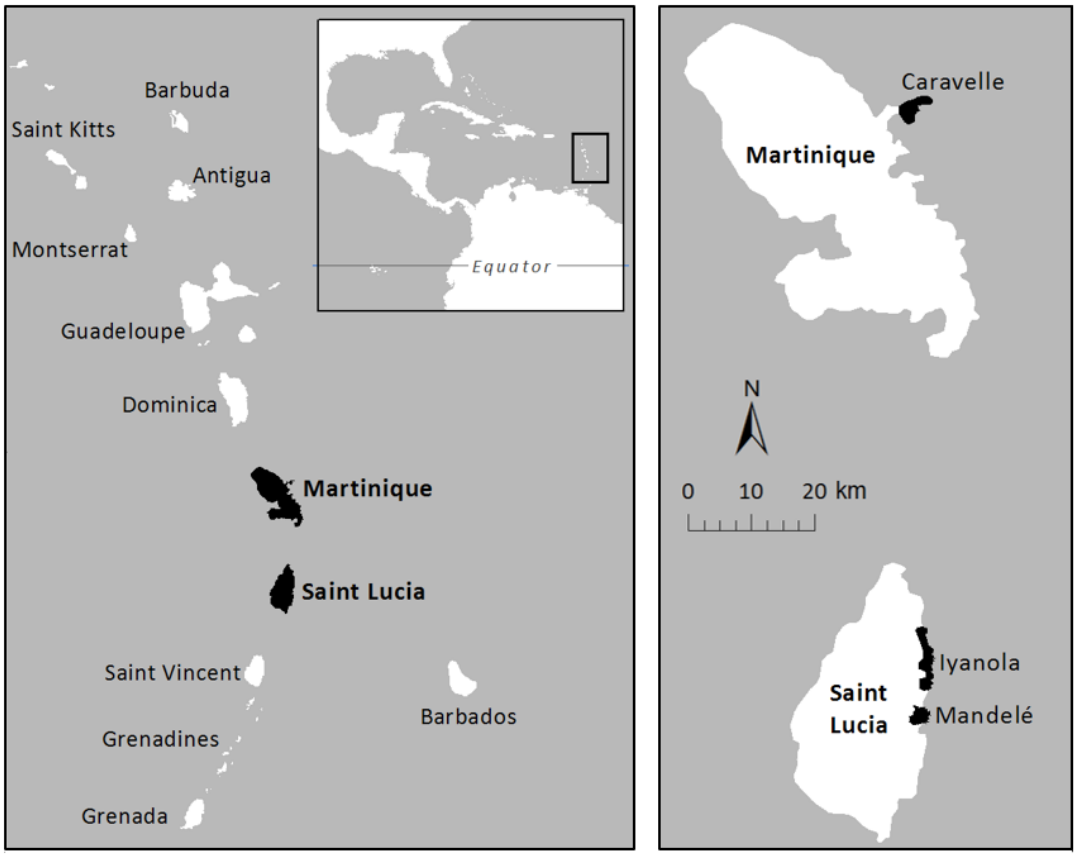

Fig. 2. Geographic distribution of the White-breasted Thrasher. The species is restricted to Martinique and Saint Lucia, shown in black at left. Within this two-island extent, it inhabits three areas, Caravelle Peninsula, Iyanola, and Mandelé, shown in black at right.

Distribution and Habitat Requirements

The White-breasted Thrasher was considered to be a more common and widespread species in the 19th century compared to today (Danforth 1935, Diamond 1973, Keith 1997, Temple 2005, Gros-Desormeaux *et al.* 2015). By the early 20th century, James Bond was already describing the species as "a very rare bird" (Bond 1928:536), writing, "I was told by an old hunter that 'the gorge-blanc' was at one time not uncommon in the southern mountains of Saint Lucia. But that they were now extinct in these parts." In the mid-20th century he wrote, "The White-breasted Thrasher (*Ramphocinclus brachyurus*) is one of the rarest of West Indian birds. Formerly it was much more numerous and widespread, but it has decreased steadily during the past hundred years, with the result that both the Martinique and Saint Lucia races are now threatened with extinction" (Bond 1957:259). The primary driver of these distributional changes was habitat loss (BirdLife International 2017). The coastal forest in which the species lives has been, and continues to be, attractive for uses by people—because of its less mountainous topography, low relative humidity, easier access, and proximity to the ocean—and consequently, White-breasted Thrasher habitat has been lost and fragmented due to urban and suburban development and agriculture (BirdLife International 2017).

The species is now found in three areas. It inhabits the Caravelle Peninsula on the central east coast of Martinique and two areas on the east coast of Saint Lucia: between Fond d'Or and Marquis (the 'Iyanola' range), and further south between the Dennery and Praslin Rivers (the 'Mandelé' range) (Fig. 3; Felix *et al.* 2014, BirdLife International 2017). There are no records of it ever occurring on any other Lesser Antillean islands. These occupied areas are not large. Within the 1,700 ha Iyanola range, thrashers inhabit only ~126 ha of riparian dry forest within the total area (Temple 2005), whereas they occur in ~450 ha of the 681 ha Mandelé range (Temple 2005, Felix *et al.* 2014). Current estimates of the species' total occupancy are ~519 ha in Martinique (Temple 2005) and ~576 ha in Saint Lucia (Temple 2005, Felix *et al.* 2014), 0.5% and 0.9% of the islands' total land areas, respectively. Actual area of occupancy in Saint Lucia is likely slightly larger, as thrashers have been sighted occasionally outside of the Iyanola and Mandelé ranges, particularly during the non-breeding season (Young *et al.* 2010; A. Toussaint pers. comm.).

The habitat requirements of the White-breasted Thrasher are relatively well described. It is a habitat specialist, occurring only in deciduous seasonal forest (hereafter 'dry forest') with a canopy higher than 5 m (Diamond 1973, Babbs *et al.* 1988, Temple 2005). However, the forest it uses need not be primary; a large portion of its current habitat in the Mandelé range was under cultivation until the last few decades of the 20th century (Graveson 2009; D. Anthony pers. comm.) and it then regenerated over the short period between then and the end of that century. Similarly, in Martinique, much of the extant forest on the Caravelle Peninsula is secondary, as the peninsula was extensively deforested for agriculture in the late 17th century (Gros-Desormeaux *et al.*

2015). Finer-scale habitat associations of the Saint Lucia subspecies were characterized by Temple (2005). Within dry forest, thrashers are associated with areas that have a higher canopy and higher tree density, abundant leaf litter, and few herbaceous plants. The areas thrashers use also have relatively high invertebrate density and are more likely to contain the shrub *Myrcia citrifolia*—used by the species to nest in and as food (berries) for adults and chicks—than are areas not occupied by the birds.

White *et al.* (2012) and Sass *et al.* (2017) used habitat suitability modeling to further understand environmental correlates of White-breasted Thrasher occurrence in Saint Lucia. Despite using different environmental data sets to build suitability models, both results support the species' strong positive association with coastal, riparian dry forest and negative association with areas near high human density. Beyond that, model results differ. Sass *et al.* (2017) also included the relationship between thrasher occurrence and predator distributions in their model, and found that thrashers were associated with areas closer to the Saint Lucia fer-de-lance (*Bothrops caribbaeus*). Whether this relationship is due to common habitat requirements, or due to fer-de-lance restricting the abundance or distribution of introduced mammalian predators of the thrasher, requires further study. Further goals of this habitat suitability modeling were to identify key sites for protection or management, as well as suitable sites for species introduction or habitat restoration. Island-wide suitability maps produced by White *et al.* (2012) and Sass *et al.*

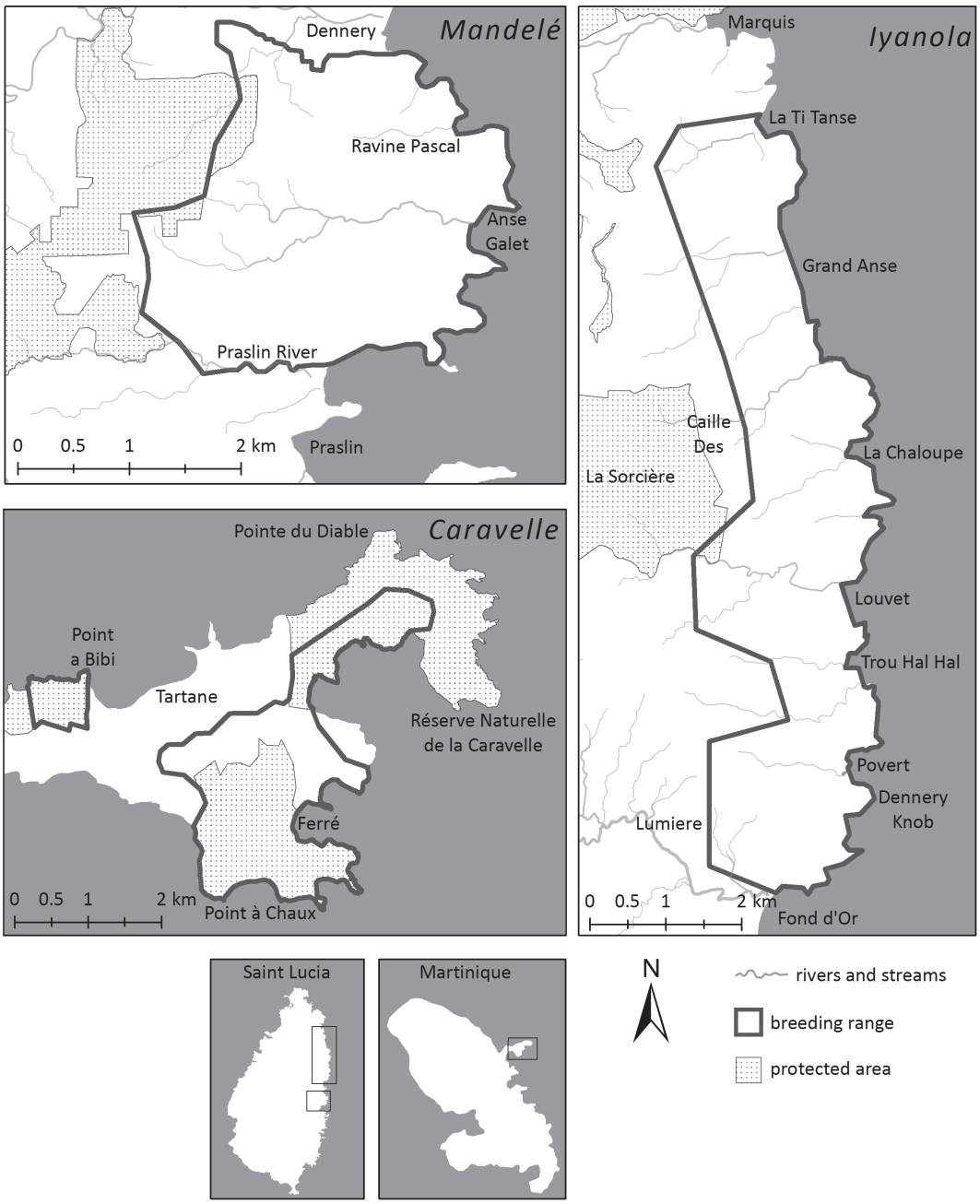

Fig. 3. White-breasted Thrasher distribution within its Mandelé and Iyanola ranges in Saint Lucia, and Caravelle Peninsula range in Martinique (breeding range boundaries from Temple [2005]).

(2017) both predicted high suitability in the Mandelé range, the species' current stronghold. Both also identified small pockets of relatively suitable habitat south of the Mandelé range; these areas are not known to be currently occupied. Much of the Iyanola range was categorized as unsuitable or marginally suitable, which aligns with field observations that thrashers occupy only a small subset of this range (Temple 2005, Young *et al.* 2010). Each study also identified some suitable areas on the west coast of the island, which are outside the species' current range, although in the Sass *et al.* (2017) model this area was minimal. We know of no evidence that White-breasted Thrashers were ever on the west coast of Saint Lucia in any numbers, if at all (Sass *et al.* 2017). Why thrashers do not inhabit the dry forest on the west coast is not known. Taken together, these habitat suitability models suggest that sites of high suitability occur only in or adjacent to the species' current delimited range, particularly within Mandelé, and that there are some areas south of Mandelé that merit investigation for the presence of thrashers.

Demography and Behavior

Much of what is known about White-breasted Thrasher survival, reproduction, and behavior comes from studies of the Mandelé population during the breeding season (April–September). Similar to many other non-migratory tropical passerines, the thrasher has relatively low nesting success and high annual adult survival (Temple 2005, Mortensen 2009). Annual nest success (the percent of nests fledging ≥ 1 chick) ranges from 20% to 39% (John 1995, Gilardi 1998, Temple 2005, Mortensen 2009), though studies with the largest sample sizes and corrections for overestimating success reported rates of 31–37% (Temple 2005, Mortensen 2009). Breeding females may lay up to four clutches during a breeding season (Temple 2005), though no more than two of these clutches usually fledge young (Mortensen and Reed 2016). Predation is the primary cause of White-breasted Thrasher nest failure (Temple 2005, Mortensen 2009). Native nest predators in Saint Lucia include the Saint Lucia boa (*Boa orophias*; Temple 2005, Freeman 2015), Saint Lucia fer-de-lance (Freeman 2015; JLM pers. obs.), American Kestrel (*Falco sparverius*; JLM pers. obs.), Broad-winged Hawk (*Buteo platypterus*; Freeman 2015), and possibly the Pearly-eyed Thrasher (*Margarops fuscatus*; Babbs *et al.* 1988). Recent trapping work suggests that predation by introduced mammals may become more common in Saint Lucia (Freeman 2015); the small Asian mongoose (*Herpestes javanicus*; Temple 2005, Freeman 2015), mannikou (common opossum [*Didelphis marsupialis*]; Temple 2005), and black rat (*Rattus rattus*; Freeman 2015) are known introduced predators, and a putative predator includes the domestic cat (*Felis catus*; Freeman 2015). In Martinique, predators include the Broad-winged Hawk and the same suite of introduced mammals as in Saint Lucia (Gros-Desormeaux *et al.* 2015). Predation is also suspected to be the most important cause of juvenile mortality, especially when fledglings are not yet fully capable of flight and spend much of their time on or near the ground (John 1995, Temple 2005, Gros-Desormeaux *et al.* 2015), but little is known about this life-history stage.

The White-breasted Thrasher is a facultative cooperative breeder (Temple *et al.* 2006, 2009, Mortensen 2009). This uncommon social behavior typically involves individuals (so-called helpers) caring for young that are not their own offspring (Brown 1987, Cockburn 2006). In the thrasher, some adult offspring stay on their natal territory and help their parents raise new offspring (their siblings) rather than disperse and breed on their own; breeding pairs can have 0–4 helpers (Mortensen 2009, Temple *et al.* 2009). Lack of suitable habitat is one hypothesis for the maintenance of cooperative breeding (Emlen 1982), and is thought to be the explanation for this behavior by the thrasher (Temple 2005). This idea was supported by an increase in cooperative breeding behavior after habitat loss associated with resort construction in the Mandelé range, where family groups increased in size following habitat loss (Mortensen 2009). Presumably, this change was due in part to more severely limited dispersal options or to displaced birds returning to previous family groups.

A common feature of cooperative breeders is short dispersal distances (Zach 1990), and this is true of the White-breasted Thrasher. Adults rarely change territories—in 3 yr, only 2 out of 94 adults moved—and many juveniles stay on their natal territories at least 1 yr post-fledging (Temple 2005). Of the birds that dispersed from their natal territory, males moved an average of 103 m and females an average of 360 m (Temple *et al.* 2006). Mortensen (2009), studying juvenile birds in the same population, found that average distance moved between re-sighting intervals (for the sexes combined) was 249 m. These dispersal distances are more than an order of magnitude lower than those reported for most avian species for which data are available (e.g., Paradis *et al.* 1998, Sutherland *et al.* 2000).

These reported very short dispersal distances raise questions about population connectivity; specifically, whether thrashers are moving among their three occupied regions. Banding and survey evidence to date (> 600 thrashers have been color-banded in Mandelé since 2002; Temple 2005, Mortensen 2009, 2016) suggest that individuals are not moving between Martinique and Saint Lucia, nor between the Iyanola and Mandelé ranges within Saint Lucia, even though these latter two areas are only 3 km apart (Felix *et al.* 2014). Recent genomic work, which provides the first description of genetic diversity and population structure of the species across its entire range, supports the field data (J.L. Mortensen *et al.* in prep.). This ongoing genomic work will also be used in re-evaluation of species limits. There is some debate about whether the Saint Lucia and Martinique subspecies merit elevation to species status (Storer 1989). While the subspecies are clearly diagnosable by plumage traits, mensural characteristics, and degree of sexual dimorphism (Storer 1989), and were sometimes considered to be distinct species (Cory 1887, Ridgway 1907), most authors have considered them as one (Hellmayr 1934, Davis and Miller 1960, AOU 1998). Ongoing analyses will help assess the existing species limits, and recognition of species-level differences would require revision of the species' IUCN Red List status.

Population Size and Trends

White-breasted Thrasher population size estimates do not exist from before the 20th century, but based on anecdotes, the population had declined greatly by then. In 1876 in Martinique, thrashers were "widespread on the island," yet in 1905, they were described as "on the verge of extinction," and in 1950, they were considered extinct (Gros-Desormeaux *et al.* 2015). In

Table 1. White-breasted Thrasher population size estimates.

Area Covered[a]	Year	Population Size Estimate	Source
Martinique			
Réserve Naturelle de la Caravelle	1987	15 pairs	Bénito-Espinal and Hautcastel 1988 in Gros-Desormeaux *et al.* 2015
Réserve Naturelle de la Caravelle	1990	40 pairs	Evans 1990 in Gros-Desormeaux *et al.* 2015
Réserve Naturelle de la Caravelle	1994–1996	40 pairs	AEVA 1996 in Temple 2005
Caravelle Peninsula	2004	249–482	Temple 2005
Réserve Naturelle de la Caravelle	2006–2007	200–400	AOMA 2008
Saint Lucia Iyanola range			
Grand Anse to Louvet	1971	75 pairs	King 1981
Petite Anse to Dennery Knob (Povert omitted)	1987	58 pairs	Babbs *et al.* 1988
Petite Anse to Dennery Knob	1992	46 pairs	Ijsselstein 1992
Petite Anse to Lumiere	2002	108–221	Temple 2005
La Ti Tanse to Dennery Knob	2006	80 (95% CI: 33–197)	Young *et al.* 2010
Saint Lucia Mandelé range			
Ravine Pascal to Praslin River	1994	16	John 1995
Entire Mandelé range	2002	1,184–2,655	Temple 2005
Entire Mandelé range	2006	1,121 (95% CI: 696–1,807)	Young *et al.* 2010
Entire Mandelé range	2007	1,034 (95% CI: 731–1,463)	Young *et al.* 2010

[a]See Fig. 3 for differences in survey coverage. La Ti Tanse and Petite Anse refer to the same location.

1951, however, a pair was rediscovered on the Caravelle Peninsula (Pinchon and Bon Saint Come 1951 in Gros-Desormeaux *et al.* 2015), and by the 2000s, the population decline driven by conversion of dry forest to agriculture and pasture and introduction of the mongoose appeared to have reversed (Table 1; Gros-Desormeaux *et al.* 2015). For the Saint Lucia Iyanola population, the decline continued throughout the 20th century (Table 1; Temple 2005, Young *et al.* 2010), but the discovery (and presumable growth) of the Mandelé population in the 1990s (John 1995) had by the 2000s reversed this declining trend for the total estimate in Saint Lucia (Table 1). Current population size estimates from Mandelé are an order-of-magnitude higher than any of the 20th or 21st century estimates from Iyanola (Table 1). Distance sampling in the Mandelé range by the Saint Lucia Department of Forest and Lands Resources Development and Durrell Wildlife Conservation Trust has occurred annually since 2006, and the published estimates from 2006 and 2007 put the population at ~1,000 individuals (Young *et al.* 2010). Using the most recent published mean estimates from each range (Table 1) produces a global population estimate of under 1,500 individuals with 21% of it residing in Martinique, 6% in Iyanola, and 73% in Mandelé. However, a recent re-analysis of the 2006 and 2007 data from Mandelé that incorporates additional data on detectability has increased the early estimates by 40–60% (M.N. Morton *et al.* in prep.) indicating that the population may be somewhat larger.

Field data (Temple 2005, Mortensen 2009, Young *et al.* 2010) were used to parameterize the first demographic population projection model for the White-breasted Thrasher (Mortensen and Reed 2016). The focus was on the Mandelé population because Mandelé is the species' current stronghold and is the site of recent, significant habitat loss. Extinction risk was sensitive to juvenile and adult survival rates. As long as survival rates remained close to the high values estimated before habitat loss, quasi-extinction risk, defined as the population falling below 100 individuals, was low under extant habitat area. However, estimated quasi-extinction risk increased under the reduced habitat area expected when current plans for resort construction are completed (Ernest 2005; see next section). Improving survival estimates and determining the cause or causes of juvenile mortality were identified as research priorities.

Threats and Conservation

The primary extant threat to the White-breasted Thrasher in Saint Lucia is habitat loss, and in Martinique, it is predation by introduced mammals (Gros-Desormeaux *et al.* 2015, BirdLife International 2017). The thrasher has been on Schedule One (Fully Protected) of Saint Lucia's Wildlife Protection Act since 1980, which prohibits take without a permit and makes it an offense to destroy the species' nests (Saint Lucia Wildlife Protection Act of 1980). However, only 4% of White-breasted Thrasher habitat in Saint Lucia is under any form of formal protection (Felix *et al.* 2014). The Mandelé range in southeastern Saint Lucia, which is largely unprotected, has recently been reduced again, due to loss of dry forest during construction of *Le Paradis* beach, golf, and marina resort (Mortensen 2009, White 2009, White *et al.* 2012). Forest clearing began in 2006, but has been at a standstill since 2008. To date, 20% of White-breasted Thrasher habitat in the Mandelé range has been lost to this development, which

is a 16% loss of thrasher habitat across all of Saint Lucia. When (or if) construction is complete, a projected 34% of the Mandelé habitat will have been lost (Felix *et al.* 2014). Since this estimate by Felix *et al.* (2014), a wind farm has been proposed adjacent to *Le Paradis*, to be built on land parcels representing an additional 16% of the Mandelé range (Caribbean News Now 2015). Potential impacts to thrasher habitat and thrasher populations during this project's operational phase are unclear. They may include positive ones for the species, such as restricted access to inhabited areas. In contrast, potential impacts during the construction phase are also unclear, but expected habitat loss and disturbance could lead to shifts in distribution away from affected areas, as was observed during construction of *Le Paradis* (Mortensen 2009, Young *et al.* 2010). In the future, the biggest drivers of habitat loss are likely to be heavy-footprint touristic developments, like *Le Paradis*, and a proposed extension of Saint Lucia's highway through the island's north-east corridor, i.e., Iyanola (Felix *et al.* 2014). In contrast, at least 50% of the species' habitat in Martinique is protected (Gros-Desormeaux *et al.* 2015) in the Réserve Naturelle de la Caravelle (established in 1976) and areas designated as zones naturelles d'intérêt écologique, faunistique et floristique (ZNIEFFs) (Temple 2005).

Another threat to the White-breasted Thrasher is non-native species, primarily predatory mammals (BirdLife International 2017). The suite of known and putative mammalian predators was discussed above. Other non-native species are not known to be thrasher predators, but some can still have negative impacts. In particular, feral and free-roaming domestic pigs (*Sus scrofa*) have destroyed the ground layer and lower vegetation over a wide area of the Iyanola range in Saint Lucia (Felix *et al.* 2014). The Shiny Cowbird (*Molothrus bonariensis*) has likely been present in Martinique since 1948 and in Saint Lucia since 1931 (Post and Wiley 1977), and it is now commonly seen in the Saint Lucia Mandelé range (JLM pers. obs.). So far, White-breasted Thrashers do not appear to be a target of nest parasitism (0 of 326 monitored nests were reported parasitized; John 1995, Gilardi 1998, Temple 2005, Mortensen 2009), though the Shiny Cowbird is recorded parasitizing the St. Lucia Oriole (*Icterus laudabilis*; Post *et al.* 1990; JLM pers. obs.).

In the past two decades, avian diseases have attracted much attention for their impacts on people, domestic animals, and wild birds (Paul 2012). Two avian diseases known to be spreading through the Caribbean region are West Nile virus (Komar and Clarke 2006) and influenza A (e.g., Senne 2010). Avian pox, though possibly already present, was only recently characterized in the Caribbean (Arathy *et al.* 2010). So far, there is no evidence of White-breasted Thrasher infection with any of these diseases (Felix *et al.* 2014). However, the blood parasites (*Haemoproteus* and *Plasmodium* species) that cause avian malaria have been recorded in the White-breasted Thrasher in Saint Lucia (Fallon *et al.* 2004) and are present in other avian species in Martinique (Fallon *et al.* 2003). The severe impacts, including species extinctions, of avian malaria on birds in Hawaii, where the disease was introduced in the late 19th century (Atkinson and LaPointe 2009), have not been reported in the Caribbean where evidence suggests the parasites and their host species have co-existed for a much longer time (Fallon *et al.* 2003).

Any small populations, and particularly those concentrated at one or a few sites, are vulnerable to stochastic environmental events such as hurricanes, flooding, and wildfires (Shaffer 1981). For example, Hurricane Allen in 1980 damaged or destroyed 80% of Saint Lucia's forests (Jeggo and Taynton 1980). More recently in 2010, Hurricane Tomas inflicted considerable, though localized, damage, primarily through landslides and flooding (Kambon *et al.* 2011). While such stochastic events may actually act to maintain tropical dry forest structure (Van Bloem *et al.* 2005), further habitat destruction, degradation, and fragmentation can be expected to reduce the resilience of these forests to the impacts of stochastic events (Laurance and Curran 2008, but see Van Bloem *et al.* 2005).

These ongoing threats motivated the development of a conservation plan for the White-breasted Thrasher (Felix *et al.* 2014). The plan is specific to the Saint Lucia subspecies, which constitutes ~80% of the thrasher's total population and faces different primary threats than the Martinique subspecies. This is the first White-breasted Thrasher conservation plan, although it was certainly not the first to recommend conservation and management actions (e.g., Temple 2005, Daltry 2009, Morton 2009, Toussaint *et al.* 2009). The plan was produced with input from a two-day participatory workshop held in Dennery, Saint Lucia, in February 2014. The main recommendations of this plan, called the Gòj Blan Plan after the species' local Kwéyòl name, are: (1) no net loss of thrasher habitat and bringing at least three sites under management, starting with existing forest reserves; (2) improvement of degraded areas within the sites under active management; and (3) reduction of non-native predators at thrasher sites. As part of meeting these objectives, high value is ascribed to education, and public awareness and participation. This approach, along with habitat protection, was key in the improved status of the St. Lucia Parrot (*Amazona versicolor*), whose population increased from ~100 individuals in the 1980s to ~2,000 today (Morton *et al.* 2011).

Conclusions

The White-breasted Thrasher is a rare species by most definitions (Rabinowitz 1981). It has a narrow geographic distribution, restricted habitat specificity, and locally small population sizes. All of these traits are linked with population persistence (Lee and Jetz 2011), with range size, in particular, being a very strong predictor of long-term extinction risk (Lee and Jetz 2011, Harnik *et al.* 2012). Clearly, stemming further loss of thrasher habitat should be a priority for species conservation. In Martinique, 50% of thrasher habitat is already under formal protection, but in Saint Lucia, only 4% is protected. However, there are current recommendations to designate the Mandelé and Iyanola ranges, both of which have already been designated Globally Important Bird Areas (Anthony and Dornelly 2008) and Key Biodiversity Areas (Wege *et al.* 2010), as a Protected Landscape and a National Park, respectively (Haffey 2009). Currently, the Government of Saint Lucia is engaged in the Iyanola Project, which aims to develop a land use plan for Iyanola and surrounding areas and put in place sustainable land management policies (Ministry of Sustainable Development, Energy, Science and Technology 2015). Beyond habitat protection, further efforts should be directed to research on forest restoration, improved annual survival estimates, and continued monitoring of population sizes.

While the call for White-breasted Thrasher research and conservation has been answered in part, further work and management interventions are needed.

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Literature Cited

American Ornithologists' Union (AOU). 1998. Check-list of North American Birds. 7th edn. American Ornithologists' Union, Washington, DC.

Anthony, D., and A. Dornelly. 2008. St Lucia. Pp. 277–283 *in* Important Bird Areas in the Caribbean (D.C. Wege and V. Anadón-Irizarry, eds.). BirdLife International, Cambridge, UK.

Arathy, D.S., D.N. Tripathy, G.P. Sabarinath, M.I. Bhaiyat, A. Chikweto, V. Matthew, and R.N. Sharma. 2010. Preliminary molecular characterization of a fowl Poxvirus isolate in Grenada. Avian Diseases 54:1081–1085.

Association Ornithologique de la Martinique (AOMA). 2008. Suivi du Moqueur gorge blanche et des autres oiseaux remarquables: Réserve Naturelle de la Caravelle (Bilan 2006–2007). Unpublished report prepared for Parc Naturel Régional de la Martinique, Fort de France, Martinique.

Association pour l'Etude et la protection des Vertébrés et Végétaux des petites Antilles (AEVA). 1996. Suivi ornithologique de la Réserve Naturelle de la Caravelle (Martinique) 1995–1996. Unpublished report no. 13 prepared for Parc Naturel Régional de la Martinique, Fort de France, Martinique.

Atkinson, C.T., and D.A. LaPointe. 2009. Ecology and pathogenicity of avian malaria and pox. Pp. 234–252 *in* Conservation Biology of Hawaiian Forest Birds: Implications for Island Avifauna (T.K. Pratt, C.T. Atkinson, P.C. Banko, J.D. Jacobi, and B.L. Woodworth, eds.). Yale University Press, New Haven, CT.

Babbs, S., S.T. Buckton, P. Robertson, and P. Wood. 1988. Report of the 1987 University of East Anglia-ICBP St. Lucia expedition. Study report no. 33. International Council for Bird Preservation, Cambridge, UK.

Bénito-Espinal, E., and P. Hautcastel. 1988. Les oiseaux menacés de Martinique et de Guadeloupe. Pp. 37–60 *in* Livre rouge des oiseaux menacés des régions françaises d'Outre-Mer (J.C. Thibault and I. Guyot, eds.). ICBP/BirdLife Monograph Series 5.

BirdLife International. 2017. Species factsheet: *Ramphocinclus brachyurus*. datazone.birdlife.org/species/factsheet/22711137.

Bond, J. 1928. On the birds of Dominica, St. Lucia, St. Vincent, and Barbados, B. W. I. Proceedings of the Academy of Natural Sciences of Philadelphia 80:523–545.

Bond, J. 1957. Notes on the White-breasted Thrasher. Auk 74: 259–260.

Brown, J.L. 1987. Helping and Communal Breeding in Birds. Princeton University Press, Princeton, NJ.

Caribbean News Now. 2015. St Lucia installs test tower for potential wind farm. www.caribbeannewsnow.com/headline-St-Lucia-installs-test-tower-for-potential-wind-farm-25692.html.

Cockburn, A. 2006. Prevalence of different modes of parental care in birds. Proceedings of the Royal Society B: Biological Sciences 273:1375–1383.

Cory, C.B. 1887. Description of a new species of *Rhamphocinclus* from St. Lucia, West Indies. Auk 4:94–95.

Daltry, J.C. 2009. Biodiversity assessment of Saint Lucia's forests, with management recommendations. Technical report no. 10 prepared for the National Forest Demarcation and Bio-Physical Resource Inventory Project, FCG International Ltd., Helsinki, Finland.

Danforth, S.T. 1935. The Birds of Saint Lucia. Monographs of the University of Puerto Rico, Series B, no. 3.

Davis, J., and A.H. Miller. 1960. Family Mimidae. Pp. 440–458 *in* Check-list of Birds of the World, Vol. 9 (E. Mayr and J.C. Green-

way, eds.). Museum of Comparative Zoology, Cambridge, UK.
Diamond, A.W. 1973. Habitats and feeding stations of St Lucia forest birds. Ibis 115:313–329.
Emlen, S.T. 1982. The evolution of helping. II. The role of behavioral conflict. American Naturalist 119:40–53.
Ernest, P. 2005. Praslin Bay Resort, Saint Lucia, West Indies: environmental and social impact study. Unpublished report prepared for DCG Properties Ltd., Castries, Saint Lucia.
Evans, P. 1990. Birds of the Eastern Caribbean. MacMillan Education Ltd., Hong Kong.
Fallon, S.M., E. Bermingham, and R.E. Ricklefs. 2003. Island and taxon effects in parasitism revisited: avian malaria in the Lesser Antilles. Evolution 57:606–615.
Fallon, S.M., R.E. Ricklefs, S.C. Latta, and E. Bermingham. 2004. Temporal stability of insular avian malarial parasite communities. Proceedings of the Royal Society of London, B 271: 493–500.
Felix, M.L., J. Mortensen, M.N. Morton, and J. Tschirky. 2014. The Gòj Blan Plan: an action plan for recovering the White-breasted Thrasher on Saint Lucia. Unpublished report prepared for the Trust for the Management of Rivers, Saint Lucia Forestry Department, Saint Lucia National Trust, Durrell Wildlife Conservation Trust, and the American Bird Conservancy, Dennery, Saint Lucia.
Freeman, K.F. 2015. Impacts of Habitat Fragmentation, Parental Care, and Social Context on Reproductive Success in the White-breasted Thrasher. M.S. Thesis. Villanova University, Villanova, PA.
Gilardi, J. 1998. White-breasted Thrashers. Unpublished report for the Wildlife Preservation Trust International, Jersey, UK.
Graveson, R. 2009. The classification of the vegetation of Saint Lucia. Technical report no. 3 prepared for the National Forest Demarcation and Bio-Physical Resource Inventory Project, FCG International Ltd., Helsinki, Finland.
Gros-Desormeaux, J.-R., T. Lesales, and A.-G. Tayalay. 2015. Behavioral observations on the White-breasted Thrasher (*Ramphocinclus brachyurus brachyurus*): conservation implications. Acta Ethologica 18:197–208.
Haffey, D. 2009. A systems plan for protected areas in Saint Lucia. Unpublished report. Organisation of Eastern Caribbean States (OECS), Castries, Saint Lucia.
Harnik, P.G., C. Simpson, and J.L. Payne. 2012. Long-term differences in extinction risk among the seven forms of rarity. Proceedings of the Royal Society B: Biological Sciences 279: 4969–4976.
Hellmayr, C.E. 1934. Catalogue of Birds of the Americas and the Adjacent Islands. Field Museum of Natural History, Zoological Series 13, pt. 7.
Ijsselstein, C. 1992. Report on the censusing of the St. Lucia White-breasted Thrasher, *Ramphocinclus brachyurus sanctaeluciae*. Unpublished report prepared for Durrell Institute of Conservation and Ecology, Canterbury, UK.
Jeggo, D.F., and K.M. Taynton. 1980. The effects of Hurricane Allen on the status of the St. Lucia Parrot *Amazona versicolor*. Dodo, Journal of the Jersey Wildlife Preservation Trust 17: 11–18.
John, C.L. 1995. The St. Lucia White-breasted Thrasher *Ramphocinclus brachyurus sanctaeluciae* project report. Unpublished project report prepared for the Saint Lucia Forestry Department, Castries, Saint Lucia.
Kambon, A., M. Hendrickson, V. Little, D. Smith, D. Gay, E. Blommestein, and I. Jackson. 2011. Saint Lucia: Macro socio-economic and environmental assessment of the damage and losses caused by Hurricane Tomas: a geo-environmental disaster. Unpublished report prepared by the Economic Commission for Latin America and the Caribbean (ECLAC) for the Government of Saint Lucia, Castries, Saint Lucia.
Keith, A.R. 1997. The Birds of St Lucia, West Indies. British Ornithologists' Union Checklist Series 15.
King, W.B. 1981. Endangered Birds of the World (the ICBP Bird Red Data Book). International Council for Bird Preservation, Cambridge, UK.
Komar, N., and G.G. Clarke. 2006. West Nile virus activity in Latin America and the Caribbean. Pan American Journal of Public Health 19:112–117.
Laurance, W.F., and T.J. Curran. 2008. Impacts of wind disturbance on fragmented tropical forests: a review and synthesis. Austral Ecology 33:399–408.
Lee, T.M., and W. Jetz. 2011. Unravelling the structure of species extinction risk for predictive conservation science. Proceedings of the Royal Society B: Biological Sciences 278:1329–1338.
Ministry of Sustainable Development, Energy, Science and Technology. 2015. Iyanola Management Project to help conserve natural habitat in the northeast. Unpublished report. Government of Saint Lucia, Castries, Saint Lucia.
Mortensen, J.L. 2009. Short-Term Behavioral and Demographic Responses of the White-breasted Thrasher (*Ramphocinclus brachyurus*) to Habitat Loss and Fragmentation. M.S. Thesis. Villanova University, Villanova, PA.
Mortensen, J.L. 2016. Multifaceted Characterization of Extinction Risk in the Endangered, Cooperatively Breeding White-breasted Thrasher (*Ramphocinclus brachyurus*). Ph.D. Dissertation. Tufts University, Medford, MA.
Mortensen, J.L., and J.M. Reed. 2016. Population viability and vital rate sensitivity of an endangered avian cooperative breeder, the White-Breasted Thrasher (*Ramphocinclus brachyurus*). PLoS ONE 11:e0148928.
Morton, M.N. 2009. Management of critical species on Saint Lucia: species profiles and management recommendations. Technical report no. 13 prepared for the National Forest Demarcation and Bio-Physical Resource Inventory Project, FCG International Ltd., Helsinki, Finland.
Morton, M.N., A. Dornelly, T. Jn Baptiste, H. Whitehead, and R.P. Young. 2011. Status of the Saint Lucia Parrot *Amazona versicolor*. Unpublished report prepared for the Government of Saint Lucia, Castries, Saint Lucia.
Paradis, E., S.R. Baillie, W.J. Sutherland, and R.D. Gregory. 1998. Patterns of natal and breeding dispersal in birds. Journal of Animal Ecology 67:518–536.
Paul, E. 2012. Emerging avian disease. Studies in Avian Biology 42:1–126.
Pinchon, R., and M. Bon Saint Come. 1951. Notes et observations sur les oiseaux des Antilles françaises. L'oiseau et RFO 21:229–277.
Post, W., T.K. Nakamura, and A. Cruz. 1990. Patterns of Shiny Cowbird parasitism in St. Lucia and southwestern Puerto Rico.

Condor 92:461–469.
Post, W., and J.W. Wiley. 1977. The Shiny Cowbird in the West Indies. Condor 79:119–121.
Rabinowitz, D. 1981. Seven forms of rarity. Pp. 205–217 *in* The Biological Aspects of Rare Plant Conservation (H. Synge, ed.). John Wiley & Sons Ltd., New York.
Ridgway, R. 1907. The Birds of North and Middle America, Part 4. Bulletin of the United States National Museum 50.
Saint Lucia Wildlife Protection Act of 1980. Wildlife Protection Act, Revised Edition, 31 December 2005. Laws of Saint Lucia Chapter 6.03.
Sass, E.M., J.L. Mortensen, and J.M. Reed. 2017. Habitat suitability models indicate the White-breasted Thrasher *Ramphocinclus brachyurus* occupies all suitable habitat in Saint Lucia. Bird Conservation International 27:96–110.
Senne, D.A. 2010. Avian influenza in North and South America, the Caribbean, and Australia, 2006–2008. Avian diseases 54:179–186.
Shaffer, M.L. 1981. Minimum population sizes for species conservation. BioScience 31:131–134.
Storer, R.W. 1989. Geographic variation and sexual dimorphism in the tremblers (*Cinclocerthia*) and White-breasted Thrasher (*Ramphocinclus*). Auk 106:249–258.
Stotz, D.F., J.W. Fitzpatrick, T.A. Parker III, and D.K. Moskovits. 1996. Neotropical Birds: Ecology and Conservation. University of Chicago Press, Chicago, IL.
Sutherland, G.D., A.S. Harestad, K. Price, and K.P. Lertzman. 2000. Scaling of natal dispersal distances in terrestrial birds and mammals. Conservation Ecology 4:16.
Temple, H.J. 2005. Ecology, Cooperative Breeding and Conservation of the White-breasted Thrasher *Ramphocinclus brachyurus*. Ph.D. Dissertation. University of Cambridge, Cambridge, UK.
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. Amos. 2009. Group structure, mating system and extra-group paternity in the co-operatively breeding White-breasted Thrasher *Ramphocinclus brachyurus*. Ibis 151:99–112.
Toussaint, A., C.L. John, and M.N. Morton. 2009. The status and conservation of Saint Lucia's forest birds. Technical report no. 12 prepared for the National Forest Demarcation and Bio-Physical Resource Inventory Project, FCG International Ltd., Helsinki, Finland.
Van Bloem, S.J., P.G. Murphy, A.E. Lugo, R. Ostertag, M. Rivera Costa, I. Ruiz Bernard, S. Molina Colón, and M. Canals Mora. 2005. The Influence of hurricane winds on Caribbean dry forest structure and nutrient pools. Biotropica 37:571–583.
Wege, D.C., D. Ryan, N. Varty, V. Anadón-Irizarry, and A. Pérez-Leroux. 2010. Ecosystems profile: the Caribbean Islands Biodiversity Hotspot. Unpublished report prepared by BirdLife International for the Critical Ecosystem Partnership Fund, Arlington, VA.
White, R.L. 2009. Assessing the Impact of Tourist Development in St. Lucia on the Endangered White-breasted Thrasher. M.S. Thesis. Imperial College, London, UK.
White, R.L., T.J. Baptiste, A. Dornelly, M.N. Morton, M.J. O'Connell, and R.P. Young. 2012. Population responses of the Endangered White-breasted Thrasher *Ramphocinclus brachyurus* to a tourist development in Saint Lucia–conservation implications from a spatial modelling approach. Bird Conservation International 22:468–485.
Young, R.P., T.J. Baptiste, A. Dornelly, H. Temple, H. Whitehead, H.G. Young, and M.N. Morton. 2010. Potential impacts of tourist developments in St Lucia on the Endangered White-breasted Thrasher *Ramphocinclus brachyurus*. Bird Conservation International 20:354–364.
Zack, S. 1990. Coupling delayed breeding with short-distance dispersal in cooperatively breeding birds. Ethology 86:265–286.

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