The Journal of Caribbean Ornithology

RESEARCH ARTICLE

Vol. 31:1–5. 2018

New documentation of pine forest nesting by the Critically Endangered Bahama Oriole (*Icterus northropi*)

Daniel C. Stonko Lehron E. Rolle Latia S. Smith Alexis L. Scarselletta Jennifer L. Christhilf
Michael G. Rowley Shannan S. Yates Shelley Cant-Woodside Leslie Brace Scott B. Johnson
Kevin E. Omland

Photo: Steven Brezinski

Birds Caribbean

The Journal of Caribbean Ornithology
jco.birdscaribbean.org ISSN 1544-4953 https://doi.org/10.55431/jco.2018.31.1-5
RESEARCH ARTICLE Vol. 31:1–5. 2018
www.birdscaribbean.org

New documentation of pine forest nesting by the Critically Endangered Bahama Oriole (*Icterus northropi*)

Daniel C. Stonko[1,2], Lehron E. Rolle[3,4], Latia S. Smith[3,5], Alexis L. Scarselletta[1,6], Jennifer L. Christhilf[1,7], Michael G. Rowley[1,8], Shannan S. Yates[3,9], Shelley Cant-Woodside[3,10], Leslie Brace[3,11], Scott B. Johnson[3,12], and Kevin E. Omland[1,13]

Abstract The Bahama Oriole (*Icterus northropi*) is a Critically Endangered species endemic to The Bahamas and currently found only on the Andros island complex. With the elevation of the Bahama Oriole to full species status in 2011, research suggested that there were fewer than 300 individuals remaining in the global population. The Bahama Oriole was also termed a "synanthropic species" based on data suggesting that the species nested almost exclusively within anthropogenic residential and agricultural habitats in introduced coconut palms (*Cocos nucifera*). These conclusions were based on population surveys primarily confined to settled areas near the coasts. However, we documented multiple pairs of orioles with breeding territories deep in pine forests, and we present the first records of Bahama Orioles nesting in pine forests—in both a Caribbean pine (*Pinus caribaea*) and native understory Key thatch palms (*Leucothrinax morrisii*). Given the predominance of the pine forests on Andros, this newly documented breeding habitat has important implications for developing population estimates and future conservation plans for the Bahama Oriole.

Keywords Bahama Oriole, endangered species, *Icterus northropi*, nesting habitat, The Bahamas

Resumen Nuevo registro de nidificación de *Icterus northropi*, especie En Peligro Crítico, en pinares—*Icterus northropi* es una especie endémica En Peligro Crítico de las Bahamas y que actualmente sólo puede encontrarse en el grupo de islas de Andros. Con el reconocimiento de *Icterus northropi* como especie en 2011, las investigaciones han sugerido que quedan menos de 300 individuos en la población global. Esta especie también fue definida como "especie sinantrópica" basado en los datos que sugieren que nidifica casi exclusivamente dentro de hábitats antropogénicos residenciales y agrícolas de *Cocos nucifera* introducidos. Estas conclusiones estuvieron basadas en muestreos poblacionales confinados, primariamente, en áreas fijadas cerca de las costas. No obstante, nosotros documentamos múltiples parejas de esta especie con territorios de cría en pinares. Presentamos los primeros registros de individuos de esta especie nidificando en pinares de *Pinus caribaea* y en palmeras de sotobosque nativas *Leucothrinax morrisii*. Dado el predominio de los pinares en Andros, este hábitat de cría recién documentado tiene implicaciones importantes para el desarrollo de estimados poblaciones y futuros planes de conservación para *Icterus northropi*.

Palabras clave Bahamas, especie amenazada, hábitat de nidificación, *Icterus northropi*

Résumé Nouvelles informations sur la nidification de l'Oriole des Bahamas (*Icterus northropi*), espèce En danger critique, dans une forêt de pin—L'Oriole des Bahamas (*Icterus northropi*) est une espèce En danger critique, endémique des Bahamas et actuellement présente uniquement sur le complexe d'îles d'Andros. Avec la reconnaissance de l'Oriole des Bahamas au rang d'espèce en 2011, la recherche a montré que sa population mondiale comptait moins de 300 individus. L'Oriole des Bahamas a également été qualifié d'espèce « synanthropique » d'après des données suggérant qu'il nichait presque exclusivement dans des habitats anthropiques résidentiels et agricoles sur des cocotiers (*Cocos nucifera*) introduits. Ces conclusions étaient fondées sur des études de population principalement limitées aux zones habitées situées à proximité des côtes. Cependant, nous avons étudié de nombreux couples d'Orioles nichant dans des pinèdes, et nous présentons les premières mentions de nidification de l'espèce dans ces forêts – pins des Caraïbes (*Pinus caribaea*) et sous-bois de palmiers indigènes (*Leucothrinax morrisii*). Étant donné la prédominance des forêts de pins sur Andros, l'identification de ce milieu en tant qu'habitat de reproduction a des implications importantes pour la mise en place d'estimations de population et l'élaboration de futurs plans de conservation de l'Oriole des Bahamas.

Mots clés Bahamas, espèce en danger d'extinction, habitat de nidification, *Icterus northropi*, Oriole des Bahamas

[1]Department of Biological Sciences, University of Maryland, Baltimore County (UMBC), Baltimore, MD 21250, USA; [2]e-mail: stonko1@umbc.edu. Full list of author information is available at the end of the article.

The Bahama Oriole (*Icterus northropi*) is a Critically Endangered species endemic to The Bahamas (BirdLife International 2018). Until 2011, the Bahama Oriole was considered a subspecies of the Greater Antillean Oriole along with three other Caribbean oriole species that are also now recognized as full species: the Cuban Oriole (*I. melanopsis*), Hispaniolan Oriole (*I. dominicensis*), and Puerto Rican Oriole (*I. portoricensis*) (Chesser *et al.* 2010). The Bahama Oriole was extirpated from the island of Abaco in the 1990s and can now only be found on Andros Island (Price 2011). Since gaining species status, a recent population survey estimated the global population to be 141 to 254 individuals (Price *et al.* 2011). The Bahama Oriole faces multiple likely threats: brood parasitism from Shiny Cowbird (*Molothrus bonariensis*), loss of nesting trees due to lethal yellowing disease affecting coconut palms (*Cocos nucifera*), and loss of coppice and pine forest habitat due to logging and residential development (Price *et al.* 2015). Introduced predators such as rats (*Rattus* spp.), cats (*Felis catus*), and dogs (*Canis familiaris*) may also pose a threat to the species.

The Bahama Oriole has previously been referred to as a "synanthropic species"—cohabiting with humans and benefiting from anthropogenic landscapes (Price *et al.* 2011, Price *et al.* 2015). The oriole was believed to nest almost exclusively in developed areas in non-native coconut palms. Price *et al.* (2011) reported that most nests (87%, or 40 out of 46) were found in coconut palms. Only a small percentage were found in native palms—6.5% (n = 3) in Key thatch palms (*Leucothrinax morrisii*) and 4.3% (n = 2) in sabal palms (*Sabal palmetto*). One nest, 2.2%, was also found in an umbrella tree (*Brassaia actinophylla*). Price *et al.* (2011) noted that, while adult orioles have been seen foraging in nearby pine and coppice during the early breeding season, all previously documented nests were located exclusively in human-altered landscapes; no Bahama Oriole nests had been documented in pine forests. However, prior breeding surveys were predominantly confined to readily accessible habitats along the eastern portion of the islands (Price *et al.* 2011).

Our objective was to determine if any Bahama Orioles nested in pine forest habitats. Since palms are the preferred nesting trees of this species (Price *et al.* 2011), and they are likely the preferred nesting tree of every other Caribbean oriole species (Jaramillo and Burke 1999, Campbell *et al.* 2016), we began by looking for nests in native palms on Andros. Finding the orioles nesting in pine forests (or other non-anthropogenic habitats) would likely have significant implications for our understanding of the population ecology and conservation needs of this Critically Endangered species.

Methods

Andros is made up of three major islands—North Andros, Mangrove Cay, and South Andros—and smaller cays separated by

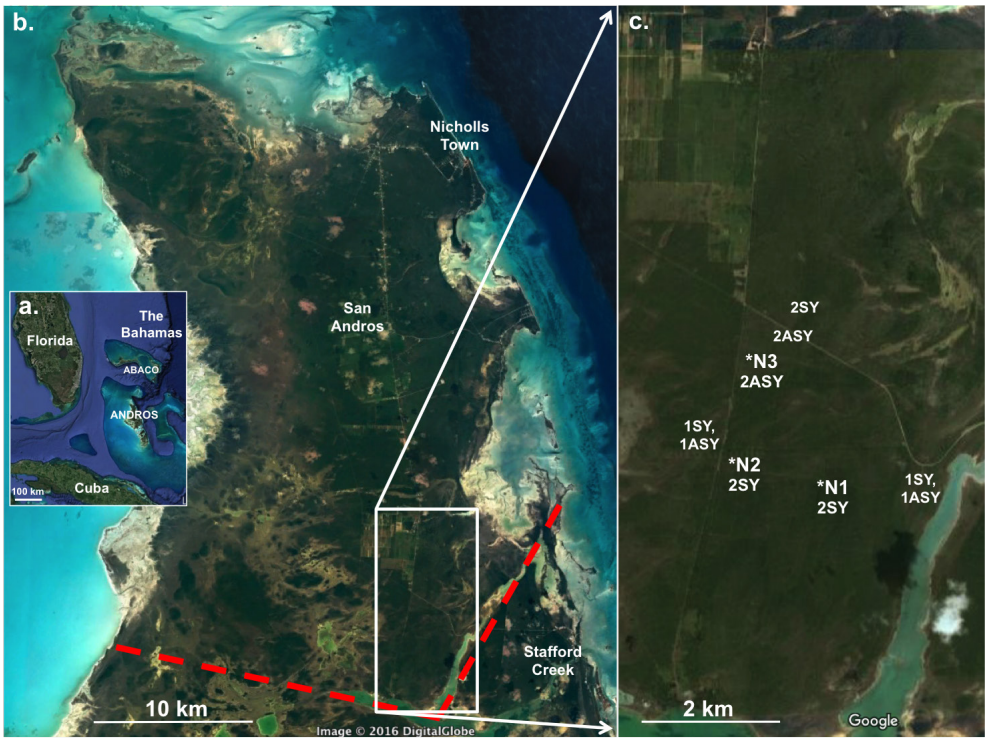

Fig. 1. Study site at multiple scales. (a) Area map showing The Bahamas. The Bahama Oriole is now restricted to the Andros complex as it was extirpated from Abaco. (b) Close up of our study site. Red dashed lines demarcate our study site in the northern one-third of North Andros Island. Wetland habitats predominate in the west, agricultural and residential areas can be seen from the northern tip running south through the center, and pine forests predominate in the east and south. (c) Close up of pine forest in the south. Three nest locations—N1, N2, and N3—are marked with asterisks. Rough territory locations are indicated for seven pairs of orioles that were repeatedly seen in specific areas, including the three pairs with nests. Territory holders are marked as ASY = after second year (adult plumage) and SY = second year (immature plumage). Agricultural areas occur in the upper left, however most of the rest of the area shown is pine forest, with some scattered wetlands.

channels and creeks, some of which are several kilometers wide (Fig. 1). Collectively referred to as Andros, this island complex is the largest in The Bahamas. Our study site included only the northern part of North Andros (north of Stafford Creek; Fig. 1b). Several human settlements are spread along the northern and eastern coasts with the island's single highway running north to south on North Andros, and wet prairie marshes and mangroves run along the west coast. However, extensive Caribbean pine (*Pinus caribaea*) forests cover a majority of North Andros. We looked for nests throughout the study site as part of a broader study from 1 May to 30 June 2016, and we especially focused our nest finding efforts in pine forests from 21 May to 1 June 2016. We used several general methods, including sightings and detection of vocalizations, to locate orioles and find their nests. Additionally, orioles collecting nesting materials from palms typically made a relatively large amount of noise as they ripped fibers from the palm fronds.

Results

We found active nests deep within pine forests of our study area—kilometers away from anthropogenic habitat (Table 1; Fig. 1c). Two nests were found in understory Key thatch palms in pine forests. The first nest was approximately 4 m above the ground in a dead, hanging frond of an approximately 4.5 m palm (nest 1; Fig. 2a, 2b). The parents at this nest were both second year (SY) Bahama Orioles. The second nest was ~1.5 km west of nest 1 and was built approximately 3.5 m above the ground in a living, hanging frond of an approximately 4 m tall palm (nest 2; Fig. 2c, 2d). Both parents at this nest were also SY Bahama Orioles. We were not able to monitor the success of these nests. In both cases, the surrounding environment consisted of slim Caribbean pines with an understory of thatch palms, ferns, and poisonwood (*Metopium toxiferum*). The nest trees were both located 1 and 2 km, respectively, away from the nearest paved road, at least 3 km away from the nearest agricultural or residential land and at least 3 km away from the nearest coconut palms (Fig. 1c).

We also found one nest in a Caribbean pine within a pine forest (nest 3; approximately 1 km north of nest 2; Fig. 2e, 2f). The nest tree was approximately 10 m tall, with the nest approximately 9 m from the ground. In this case, the parents were two adult, after second year (ASY) Bahama Orioles. We observed both individuals bringing food to the nest on multiple days, and we were able to track the successful fledging of young from this nest. The surrounding forest did not differ from the previously described forest, consisting of a scattered Caribbean pine overstory and a palm, fern, and poisonwood understory. The nearest paved road was 1 km away, and the nearest coconut palms were at least 2 km away. Furthermore, we repeatedly saw four other pairs of orioles in consistent locations in nearby parts of the pine forest (Fig. 1c), including pairs of both SY and ASY birds.

Our team also found many nests in coconut palms in anthropogenic habitats as previously described by Price *et al.* (2011). With the help of local residents, we found approximately 15 different nests in coconut palms, including some re-nests, that were likely in the territories of approximately 10 different oriole pairs. Most of these nests were in settlements 5–25 km north of the pine forest nests. Additionally, we found two nests (one active, one inactive) in banana (*Musa* sp.), and we found one nest in a royal palm (*Roystonea regia*), thus adding two more tree species in which Bahama Orioles can nest (Table 1).

Table 1. Characteristics of three active Bahama Oriole nests found in Key thatch palms and a Caribbean pine within pine forests in our study area (nests 1–3) and three nests found in other trees within anthropogenic habitat (nests 4–6).

Site	Species	Height of Tree (m)	Nest Height from Ground (m)	Distance to Nearest Paved Road (m)[a]
Nest 1	*Leucothrinax morrisii*	4.5	4	1,000
Nest 2	*L. morrisii*	4	3.5	2,000
Nest 3	*Pinus caribaea*	10	9	1,000
Nest 4	*Musa* sp.	5	4	60
Nest 5	*Musa* sp.	4	3	50
Nest 6	*Roystonea regia*	12	10	15

[a]Used as proxy for anthropogenic habitats (such as houses, farms, or coconut palms) since nest trees in pine forests were always closer to a paved road than to anthropogenic habitats. Approximate measurements based on satellite imagery.

Only one individual per mating pair of Bahama Orioles, assumed to be the female, constructs their nest (Price *et al.* 2011). At both nest site 1 and nest site 2, the individuals that we observed building the nests were yearlings (Fig. 3). Furthermore, in these and several other cases, breeding pairs consisted of two SY individuals. These observations provide strong evidence that female Bahama Orioles can breed within their first year of life.

Discussion

We discovered Bahama Orioles nesting within the pine forest, building nests in understory palms and in pine trees themselves. These findings demonstrate that Bahama Orioles are able to utilize a wider range of breeding habitats than previously thought. The three nests we found were all ≥ 1 km deep within pine forests, far from the settlements and coconut palms upon which previous research suggested the orioles were perhaps dependent. Our team also documented approximately 5–10 other pairs of orioles that seemed to have territories deep within pine forest (Fig. 1c; unpubl. data). These findings demonstrate that Bahama Orioles utilize and nest in both anthropogenic and non-anthropogenic habitats in North Andros. While we found nests in coconut palms as previously documented (Price *et al.* 2011), we also found nests in previously undocumented species of trees and habitats. Given the Bahama Oriole's use of pine forests and native understory palms, the Bahama Oriole seems to be less dependent upon anthropogenic habitats and introduced coconut palms than previously thought.

It seems likely that the orioles have used native palms (e.g., Key thatch palms and sabal palms) for nesting throughout most of their evolutionary history in the Bahamas. DNA data suggest that different oriole species were evolving independently on the major islands of the Caribbean for at least 1–2 million years (Omland *et al.* 1999, Sturge *et al.* 2009). All other Caribbean species

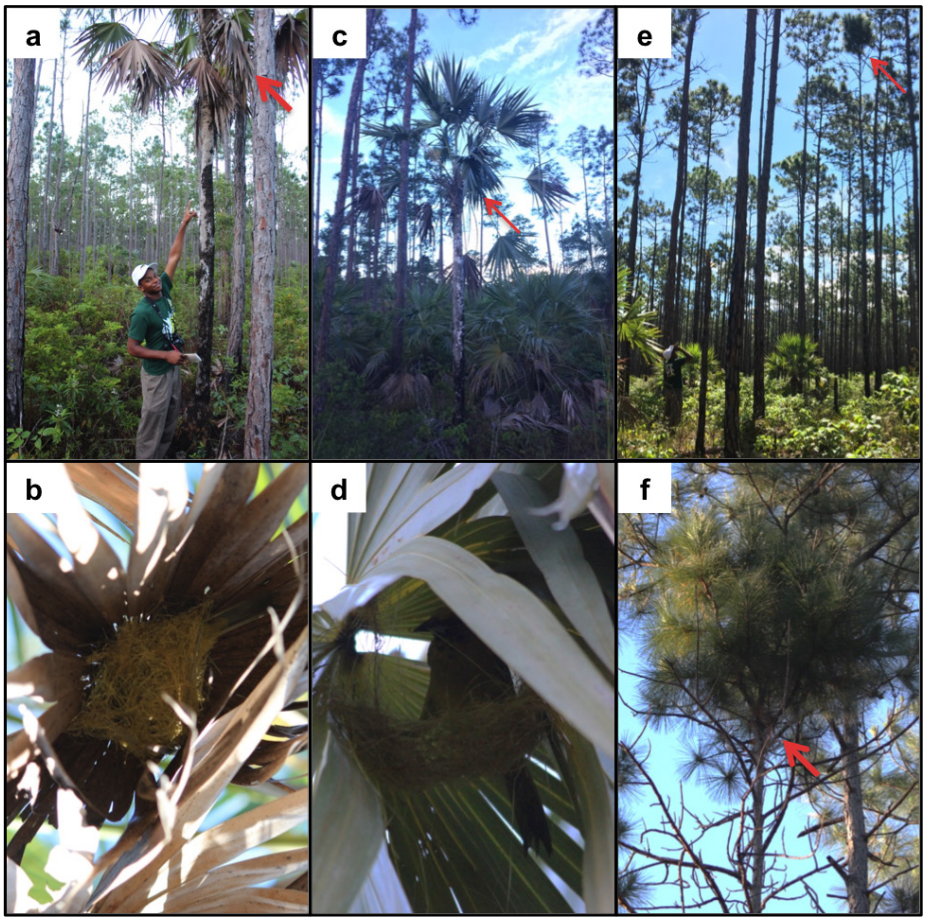

Fig. 2. Photographs of the Bahama Oriole nests and nesting trees documented deep in the pine forest: (a, b) nest 1, (c, d) nest 2, and (e, f) nest 3. Nests 1 and 2 were in Key thatch palm; nest 3 was in Caribbean pine. The top three photographs (a, c, e) show the general placement of the nests (highlighted by red arrows); the bottom three photographs (b, d, f) show closer views of the nests. (b) shows the tail of an SY individual and (d) shows the front of an SY individual building a nest (palm fiber in bill). (f) shows the general placement of the nest (red arrow); both parents at this nest were in full adult plumage (ASY). Photographs by Daniel C. Stonko.

of *Icterus* seem to strongly prefer nesting in palms (Jaramillo and Burke 1999, Campbell *et al.* 2016). However, coconut palms are native to the Indo-Pacific and only arrived in the Bahamas in the last 500 yr or so with European colonists (Gunn *et al.* 2011). Thus, it is logical to conclude that Bahama Orioles have likely long used thatch palms as nesting trees, and it seems likely that pine forests may be one of the habitats that these orioles have used for at least tens of thousands of years.

Price *et al.* (2011) noted that population abundance may differ from their estimated values if orioles were to nest in the pine forest interior or less accessible western portions of the island. Taking into account both our findings and the existing vast pine forests that stretch across Andros, future detailed evaluation of potential nesting habitat is needed. If the oriole is able to use much of the pine forest for breeding, then the population size could be larger than estimated by Price *et al.* (2011). Rigorous population counts of the whole island complex are underway (e.g., using hierarchical distance sampling; Sillett *et al.* 2012). If pine forests are an important breeding habitat for the orioles, then it is crucial to include these forests in habitat management plans. However, much more research is needed on Bahama Orioles in the pine forest. The observed successful fledging from the Caribbean pine nest suggests that pine forests are a viable breeding habitat for the species, but further study should examine the levels of reproductive success across different breeding habitats.

It will be important to expand understanding of the breeding ecology and population dynamics of Bahama Oriole in non-anthropogenic habitats. The pine forest presents many unique issues that were not previously considered important for this species. Thus, our findings raise new and important questions. For example, what role do forest fires play in the survival and reproduction of Bahama Orioles? What predators do Bahama Orioles face in the pine forest habitats? Preliminary data using game cameras suggest feral cats may be present throughout the pine forest (DCS unpubl. data). How abundant are Shiny Cowbirds in anthropogenic versus pine habitats? (Anecdotally, we have seen few or no cowbirds in pine forests.) Which of the several different habitat types are the most productive breeding habitats? Documenting the habitats most needed throughout the annual cycle is also necessary so that effective land conservation measures can be implemented. However, our findings clearly suggest that pine forests may be an important breeding habitat for this Critically Endangered oriole.

Fig. 3. SY Bahama Oriole carrying a palm frond fiber as nest building material. This likely female was constructing a nest in an understory Key thatch palm within a pine forest. Photograph by Daniel C. Stonko.

Acknowledgments

This research was conducted as part of the Bahama Oriole Project, a collaboration between the Omland Lab, University of Maryland, Baltimore County, and the Bahamas National Trust. The Bahama Oriole Project received initial funding from the Mohamed bin Zayed Species Conservation Fund (project 152511913). Grants from The Explorers Club Youth Activity Fund supported Daniel Stonko, Alexis Scarselletta, Michael Rowley, and Jennifer Christhilf. The American Bird Conservancy funded three local assistants; we especially thank David Wiedenfeld, Daniel Lebbin, John Tschirky, and Holly Robertson. Matt Jeffery at the National Audubon Society provided advice and logistical support. We thank Lisa Sorenson and BirdsCaribbean for advice and logistical support. Dr. Ethan Freid of Bahamas National Trust helped confirm palm identifications. Matthew Kane assisted with figures and literature cited, and Briana Yancy compiled data on palm nesting by other species of orioles. We are very grateful to residents and businesses of Andros for their hospitality and cooperation. Finally, DCS personally thanks Anne Riddle for her support, guidance, and scientific inspiration.

Author Information

[1]Department of Biological Sciences, University of Maryland, Baltimore County (UMBC), Baltimore, MD 21250, USA; [2]e-mail: stonko1@umbc.edu; [3]Bahamas National Trust, PO Box N-4105, Nassau, N.P., Bahamas; [4]e-mail: earlstain@gmail.com; [5]e-mail: latiasamone1847@gmail.com; [6]e-mail: scar2@umbc.edu; [7]e-mail: jc18@umbc.edu; [8]e-mail: micro6@umbc.edu; [9]e-mail: shannanyates07@gmail.com; [10]e-mail: scant@bnt.bs; [11]e-mail: lbrace@bnt.bs; [12]e-mail: sjohnson@bnt.bs; [13]e-mail: omland@umbc.edu

Literature Cited

BirdLife International. 2018. Species factsheet: *Icterus northropi*. www.datazone.birdlife.org/species/factsheet/22736369.

Campbell, S.K., A.L. Morales-Perez, J.F. Malloy, O.C. Muellerklein, J.A. Kim, K.J. Odom, and K.E. Omland. 2016. Documentation of female song in a newly recognized species, the Puerto Rican Oriole (*Icterus portoricensis*). Journal of Caribbean Ornithology 29:28–36.

Chesser, R.T., R.C. Banks, F.K. Barker, C. Cicero, J.L. Dunn, A.W. Kratter, I.J. Lovette, P.C. Rasmussen, J.V. Remsen, Jr., J.D. Rising, D.F. Stotz, and K. Winker. 2010. Fifty-first supplement to the American Ornithologists' Union *Check-list of North American Birds*. Auk 127:726–744.

Gunn, B.F., L. Baudouin, and K.M. Olsen. 2011. Independent origins of cultivated coconut (*Cocos nucifera* L.) in the Old World tropics. PLoS One 6:e21143.

Jaramillo, A., and P. Burke. 1999. New World Blackbirds: the Icterids. Princeton University Press, Princeton, NJ.

Omland, K.E., S.M. Lanyon, and S.J. Fritz. 1999. A molecular phylogeny of the New World orioles (*Icterus*): the importance of dense taxon sampling. Molecular Phylogenetics and Evolution 12:224–239.

Price, M.R. 2011. Behavioral Ecology, Taxonomy, and Conservation Genetics of the Bahama Oriole (*Icterus northropi*). Ph.D. Thesis. Loma Linda University, Loma Linda, CA.

Price, M.R., V.A. Lee, and W.K. Hayes. 2011. Population status, habitat dependence, and reproductive ecology of Bahama Orioles: a critically endangered synanthropic species. Journal of Field Ornithology 82:366–378.

Price, M.R., C. Person, and W.K. Hayes. 2015. Geographic variation and genetic structure in the Bahama Oriole (*Icterus northropi*), a critically endangered synanthropic species. PeerJ 3:e1421.

Sillett, T.S., R.B. Chandler, J.A. Royle, M. Kéry, and S.A. Morrison. 2012. Hierarchical distance-sampling models to estimate population size and habitat-specific abundance of an island endemic. Ecological Applications 22:1997–2006.

Sturge, R.J., F. Jacobsen, B.B. Rosensteel, R.J. Neale, and K.E. Omland. 2009. Colonization of South America from Caribbean islands confirmed by molecular phylogeny with increased taxon sampling. Condor 111:575–579.

Cite this article as:

Stonko, D.C., L.E. Rolle, L.S. Smith, A.L. Scarselletta, J.L. Christhilf, M.G. Rowley, S.S. Yates, S. Cant-Woodside, L. Brace, S.B. Johnson, and K.E. Omland. 2018. New documentation of pine forest nesting by the Critically Endangered Bahama Oriole (*Icterus northropi*). Journal of Caribbean Ornithology 31:1–5. https://doi.org/10.55431/jco.2018.31.1-5