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Incorporation of anthropogenic materials into passerine nests on St. Eustatius, Caribbean Netherlands

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Photo: Hannah Madden

Incorporation of anthropogenic materials into passerine nests on St. Eustatius, Caribbean Netherlands

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Cover Page: Bananaquit (*Coereba flaveola*) nest constructed in an acacia (*Vachellia* spp.) tree within a patch of thorny vegetation, located on the edge of a paved road along Chapelpiece Road, St. Eustatius, on 22 March 2022. Woven into the nest are many strands of light gray and white-colored man-made polyester fibers. Photo by Hannah Madden.

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Abstract

Urbanization has introduced novel materials for nesting birds, including anthropogenic debris that may be dangerous to adults and nestlings (e.g., entanglement or ingestion leading to injury or mortality). We present two observations of incorporation of man-made materials into passerine nests on St. Eustatius, Caribbean Netherlands. This is the first publication of such observations for St. Eustatius, and addresses a gap in literature that acknowledges the use of anthropogenic litter by landbirds in the wider Caribbean.

Keywords

anthropogenic litter, fiber, nest construction, plastic, St. Eustatius, urbanization

Resumen

Incorporación de materiales antropogénicos en nidos de passeriformes en San Eustaquio, Caribe Neerlandés • La urbanización ha introducido nuevos materiales para las aves que nidifican, incluidos desechos antropogénicos que pueden ser peligrosos para los adultos y los polluelos (p. ej., al causar enredos o ingestión que provoquen lesiones o muerte). Presentamos dos observaciones de la incorporación de materiales hechos por el hombre en nidos de passeriformes en San Eustaquio, Caribe Neerlandés. Esta es la primera publicación de este tipo de observaciones para esta isla y llena un vacío en la literatura que reconoce el uso de basura antropogénica por parte de las aves terrestres en el Caribe.

Palabras clave

basura antropogénica, construcción de nidos, fibra, plástico, San Eustaquio, urbanización

Résumé

Intégration de matériaux d'origine anthropique dans les nids de passereaux à Saint-Eustache, aux Antilles néerlandaises • L'urbanisation a mis de nouveaux matériaux à la disposition des oiseaux nicheurs, notamment des débris d'origine anthropique qui peuvent être dangereux pour les adultes et les oisillons (p. ex. en causant un enchevêtrement ou une ingestion entraînant des blessures ou la mort). Nous présentons deux observations de l'intégration de matériaux artificiels dans des nids de passereaux à Saint-Eustache, aux Antilles néerlandaises. Il s'agit de la première publication de telles observations pour Saint-Eustache, et elle comble une lacune dans la littérature qui reconnaît l'utilisation de débris d'origine anthropique par les oiseaux terrestres dans la grande région Caraïbe.

Mots clés

Construction de nids, débris d'origine anthropique, fibre, plastique, Saint-Eustache, urbanisation

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Terrestrial avifauna are renowned for their ability to construct a wide variety of nest structures (Englert Duursma *et al.* 2018). Besides its primary function as a chamber for eggs and offspring, a nest may protect against predators and ectoparasites, and provide a suitable microclimate for adults and fledglings (Loye and

Carroll 1998, Mainwaring *et al.* 2014). Nests are constructed from a variety of materials, which are usually classified as structural or lining materials (Mainwaring *et al.* 2014). Structural materials form the overall shape of the nest, whereas lining materials create a suitable microclimate for offspring (Hansell 2000, 2005). Some species also select materials for decoration, such as male bowerbirds (Family Ptilonorhynchidae), whose decorated nests provide increase reproductive opportunities (Jagiello *et al.* 2018).

The Caribbean is a biodiversity hotspot due to its high levels of endemism, but has suffered extensive forest cover loss (Anadón-Irizarry *et al.* 2012). In addition to forest loss, urban areas have been extensively transformed (Johnson and Munshi-South 2017). Such urbanization processes have not only altered the environment, they have also changed the type and abundance of nesting materials available for birds (Seress and Liker 2015). Plastics and other man-made materials in the Caribbean are abundant in urbanized areas (Townsend and Barker 2014) and may pose a threat for birds (Hartwig *et al.* 2007). However, studies on interactions with anthropogenic materials among Caribbean landbirds are scarce (Jagiello *et al.* 2019). In the USA, some studies have been published on the effects of anthropogenic litter on nestlings in landbird nests (e.g., Blem *et al.* 2002, Townsend and Barker 2014). The aim of our study was to conduct a preliminary assessment of the incorporation of anthropogenic litter into landbird nests in a small study area on St. Eustatius, which, if confirmed, would provide a baseline for more robust studies in the Caribbean region and encourage implementation of protective measures regarding waste disposal.

Observations

St. Eustatius is a small (21 km²; 17°29'N, 62°59'W), volcanic island in the northern Lesser Antilles. Straddled by two volcanoes to the north and south, the majority of the human population (~3,200 inhabitants; Centraal Bureau voor de Statistiek 2022) inhabits the center of the island. Fragmented vegetation in this area is composed of scattered trees (native, cultivated, and invasive), which are often blanketed by the invasive vine *Antigonon leptopus* (van Andel *et al.* 2016). Free-roaming livestock (Madden 2020), industrial development, human disturbance, and severe weather have contributed to loss and deterioration of native vegetation in urban areas, especially over recent decades (de Freitas *et al.* 2012). Sixteen species of resident landbirds (14 native and 2 non-native) have been recorded in the urban areas of St. Eustatius, including Lesser Antillean Bullfinch (*Loxigilla noctis*), Bananaquit (*Coereba flaveola*), and Black-faced Grassquit (*Melanospiza bicolor omissa*) (Madden and van Zanten 2020).

We conducted fieldwork between 24 March and 12 April 2022 in an urban area (0.08 km²) on St. Eustatius, Caribbean Netherlands. The area comprises a mixture of private residences and gardens situated within an urbanized landscape, which we felt would suitably represent an urban area for our study. We searched for accessible nests of all landbird species located between 0.5 m and 2 m above ground level. Upon discovering a nest containing anthropogenic materials, we georeferenced it with a GPS device and checked the status of the nest (active/inactive). When a nest was active, we continued to monitor it once a week until it was no longer occupied, whereupon we collected the nest. Collected nests were dried overnight to eliminate hu-

midity. Nests were weighed using an electronic scale and subsequently dismantled. Nest components were separated and classified as either non-anthropogenic or anthropogenic materials. The latter were classified by type and the ratio of each was calculated based on the total dry weight of the nest.

We encountered 19 bird nests, of which 17 appeared to be constructed solely with non-anthropogenic (i.e., natural) material and were left *in situ*. Because both nests with anthropogenic materials were active, we were able to identify the occupying species during fieldwork. We collected one nest each of a Black-faced Grassquit (nest 1) and Bananaquit (nest 2). The first nest was located within the yard of HM's private residence, and the second nest was located on the edge of a patch of thorny vegetation, parallel to a paved road; both nests had been constructed in acacia (*Vachellia* spp.) trees. Nest 1 had a total dry mass of 13.88 g, including 0.60 g (4.32%) of white/cream colored linen and cotton twine and 1.28 g (9.22%) of clear and white plastic bag fragments (Fig. 1A, 1C–D). Nest 2 had a total dry mass of 20.75 g, of which 3.07 g (14.80%) contained light gray- and white-colored man-made polyester fibers (Fig. 1B, 1E). Non-anthropogenic materials in both nests consisted primarily of dry grass, small twigs, seed down, and small feathers.

Discussion

The incorporation of anthropogenic material into nests has been extensively documented in seabird species (e.g., Votier *et al.* 2011, de Souza Petersen *et al.* 2016, Tavares *et al.* 2016, Grant *et al.* 2018, O'Hanlon *et al.* 2019, Yaghmour and Al Marashda 2020, Massetti *et al.* 2021), but comparative observations among landbird species are scarce, especially in the Caribbean (Jagiello *et al.* 2019). Here, we highlight the first known observations of incorporation of anthropogenic materials into passerine nests in an urbanized area on St. Eustatius. Our results demonstrate the use of anthropogenic debris as nesting material in 2 out of 19 nests encountered in a small study area on St. Eustatius. Both nests were active upon discovery; however, we were unable to determine the fate of either. We left 17 nests *in-situ* because no anthropogenic materials were externally visible during fieldwork, but it is possible that small amounts of debris were present within the nests (Esquivel *et al.* 2020). A number of studies have documented a correlation between urbanization and a change in the type of nesting materials (e.g., Wang *et al.* 2009, Radhamany *et al.* 2016, Reynolds *et al.* 2016), while other studies have not (e.g., Townsend and Barker 2014, Hanmer *et al.* 2017). While nest design may be species-specific (Reynolds *et al.* 2019), nest construction may also be related to an increased availability of anthropogenic nesting materials and a reduction in native plant materials (Wang *et al.* 2009, Radhamany *et al.* 2016). Furthermore, *sensu* Wang *et al.*'s (2009) 'availability hypothesis', the higher prevalence of anthropogenic debris in urban areas may result in nest composition simply being associated with whatever materials are locally available. Over the past four decades, vegetation in our study area has been drastically altered by free-roaming grazers, whose preference for native tree saplings and seedlings has resulted in a dominance of invasive (e.g., *Antigonon leptopus*), spiny (e.g., *Vachellia* spp., *Randia aculeata*), and toxic plant species (e.g., *Jatropha gossypifolia*, *Lantana involucreta*, *Comocladia dodonaea*) (van Andel *et al.*

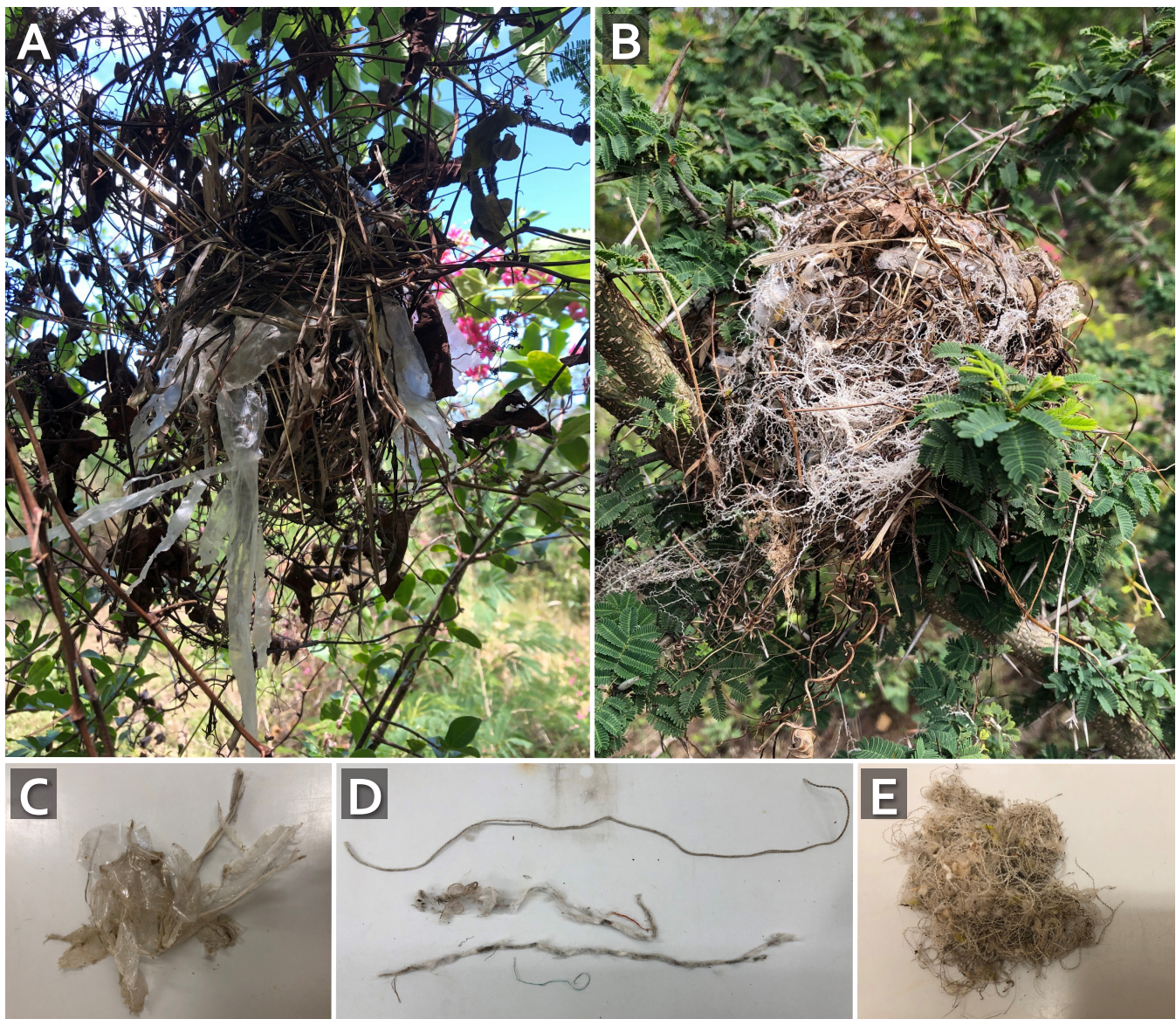


Fig. 1 Nests of Black-faced Grassquit (A; nest 1) and Bananaquit (B; nest 2) with anthropogenic materials incorporated into their structures on St. Eustatius, Caribbean Netherlands. Plastic fragments (C) and cotton and linen twine (D) from nest 1, polyester fibers (E) from nest 2.

2016). As a result, breeding passerines—which forage close to their nest sites—are forced to forage in areas of lower quality than areas with native vegetation (Ortega *et al.* 2006).

The presence of anthropogenic materials in nests may increase their visibility and, consequently, the risk of predation (Borges and Marini 2010). Quantifying anthropogenic materials used for nest construction may be a relatively simple technique that can be implemented as a pollution indicator in urban environments (Grant *et al.* 2018). Removing anthropogenic waste from nests is not a feasible ethical option (Votier *et al.* 2011), thus reducing or eliminating these materials from nests locally requires proper waste management (such as recycling or waste recovery; Comăniță *et al.* 2016) and the reduction of inorganic waste generation overall. It is likely that observations of incorporation of anthropogenic debris in bird nests will increase, and to that end we recommend that similar search efforts be made

on other Caribbean islands to quantify the extent of this phenomenon in urban environments. We further recommend that this study be replicated on St. Eustatius with a larger sample size and dissection of all nests monitored once inactive.

Acknowledgments

See Supplement.

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