J. Carib. Ornithol. 19:8-11, 2006

GROUND VERSUS ABOVE-GROUND NESTING OF COLUMBIDS ON THE SATELLITE CAYS OF ST. CROIX, US VIRGIN ISLANDS

DOUGLAS B. MCNAIR[1] AND CLAUDIA D. LOMBARD[2]

[1]*Division of Fish and Wildlife, Department of Planning and Natural Resources, 45 Mars Hill, Frederiksted, United States Virgin Islands 00840, USA;* current address: *Sapphos Environmental, Inc., 133 Martin Alley, Pasadena, California 91105, USA; e-mail: dmcnair@sapphosenvironmental.com;* [2]*United States Fish and Wildlife Service, Federal Building, 3013 Estate Golden Rock, Christiansted, United States Virgin Islands 00820-4355, USA*

Abstract: We examined the incidence of ground versus above-ground nesting of columbids on four nearshore cays off St. Croix, US Virgin Islands. Roof rats (*Rattus rattus*) occurred on two cays (Protestant Cay, Ruth Island), whereas rats were absent from the two other cays (Buck Island, Green Cay) in 2002-2003. We discovered 6 ground nests (2.1%) of three columbids out of 288 nests of five columbids, including the first documented record of ground nesting by the Scaly-naped Pigeon (*Patagioenas squamosa*). The proportion of ground nests on cays with or without rats was similar (1.5% versus 3.4%). Despite flexible nest-site placement of ground and above-ground nests of columbids on inhabited and uninhabited cays off St. Croix, the low number and restriction of ground nests to early successional habitats suggest that columbids may prefer breeding above-ground when suitable nest-sites are available in more mature habitats regardless of the presence or absence of rats.

Key words: above-ground nests, cays, columbids, ground nests, *Patagioenas squamosa*, *Rattus rattus*, roof rat, Scaly-naped Pigeon, St. Croix, US Virgin Islands

Resumen: NIDIFICACIÓN EN EL SUELO VS SOBRE EL SUELO DE COLÚMBIDOS EN LOS CAYOS SATELLITE DE ST. CROIX, ISLAS VÍRGENES DE EEUU. Se examinó la incidencia de nidificación en el suelo y sobre el suelo de colúmbidos en cuatro cayos adyacentes a St. Croix, Islas Vírgenes de EEUU. Las ratas (*Rattus rattus*) aparecieron en dos de los cayos (Protestant Cay, Ruth Island), mientras que estuvieron ausentes de otros dos cayos (Buck Island, Green Cay) en 2002-2003. Se descubrieron seis nidos en el suelo (2.1%) de tres columbidos, de los 288 nidos de cinco columbidos, incluyendo el primer registro documentado de nidificación en el suelo de la Torcaza Cuellimorada (*Patagioenas squamosa*). Las proporciones de nidos en el suelo entre los cayos con y sin ratas fue similar (1.5 % versus 3.4 %). A pesar de la flexibilidad en la selección de sitios de nidificación en el suelo o sobre este, de los columbidos en cayos habitados o deshabitados adyactentes a St. Croix, la pequeña cantidad y la restricción de los nidos en el suelo a hábitats sucesionales tempranos sugieren que los columbidos pueden preferir nidificar en lugares altos cuando existen sitios asequibles en hábitats maduros, independientemente de la presencia o no de ratas.

Palabras clave: nidos sobre el suelo, cayos, columbidos, Islas Vírgenes de EEUU, nidos en el suelo, *Patagioenas squamosa*, *Rattus rattus*, ratas, Torcaza Cuellimorada, St. Croix

Résumé : NIDIFICATION AU SOL COMPAREE A NIDIFICATION AU-DESSUS DU SOL DES COLOMBIDES SUR LES ILETS SATELLITES DE ST. CROIX, ILES VIERGES AMERICAINES. Nous avons comparés la nidification au sol par rapport à la nidification au dessus du sol des colombidés sur 4 ilots de St. Croix, Iles Vierges Américaines. Le Rat noir (*Rattus rattus*) est présent sur 2 ilots (Protestant Cay, Ruth Island), alors qu'il était absent des deux autres (Buck Island, Green Cay) en 2002-2003. 6 nids (2,1%) de 3 espèces de colombidés sur les 288 répertoriés de 5 espèces, ont été découverts au sol, dont la première observation confirmée de nidification au sol du Pigeon à couronne blanche (*Patagioenas squamosa*). La proportion de nids au sol était la même sur les ilots avec ou sans rat (1,5% vs. 3,4%). En dépit de la localisation souple du choix des sites de nidification, au sol ou non, des colombidés sur les ilots habités ou non de St. Croix, le nombre réduit et la localisation des nids au sol aux premiers stades de la succession des habitats, suggère que les colombidés préfèrent nicher au dessus du sol quand des sites adéquats sont disponibles dans des habitats plus évolués, qu'il y ait ou non présence de rats.

Mots-clés : nids au dessus du sol, ilots, columbidés, nids terrestres, *Patagioenas squamosa*, *Rattus rattus*, Pigeon à couronne blanche, St. Croix, Iles Vierges Américaines

GROUND NESTING by some columbids, especially the Zenaida Dove (*Zenaida aurita*), may be frequent on cays in the Culebra Archipelago of Puerto Rico and the northern United States Virgin Islands where nest density is greater than on the main islands (Nellis *et al*. 1984, Burger *et al*. 1989, 1991, Rivera-Milan and Schaffner 2002). The cays where these studies were conducted are dominated by rock and grassland-scrub vegetation ≤1 m tall (Dammann and Nellis 1992, Rivera-Milan and Schaffner 2002). Though trees and other woody vegetation were available on some cays, most Zenaida Doves nested on the ground, on flat rocks, in rock crevices, under rock boulders, and on soil completely or partially

covered by vegetation. Ground nests, however, had generally lower success than nests above-ground and overall reproductive success on these cays was low (22-26%), despite the absence of exotic mammalian predators.

The small Indian mongoose (*Herpestes javanicus*) and roof rat (*Rattus rattus*) are major predators on nests of landbirds on some cays off Puerto Rico and the U.S. Virgin Islands where these predators occur (Nellis *et al*. 1984, Campbell 1991, Rivera-Milan and Schaffner 2002). Land crabs (*Gecarcinus ruricola*) were the main predator on Zenaida Dove nests (eggs and nestlings) on cays off St. Thomas, where mammalian predators were absent (Nellis *et al*. 1984). Despite heavy predation by crabs on small islands without mammalian predators (Nellis *et al*. 1984, Burger *et al*. 1991, Rivera-Milan and Schaffner 2002), tree-nesting by some columbids (including Zenaida Doves), if sites are available, generally predominates on small islands with rats and ground nesting on small islands without rats (and other mammalian predators).

Off St. Croix, three of the four cays have always been mongoose-free and the mongoose was successfully eradicated from Buck Island by the 1990s. Roof rats formerly occurred on all four cays. They were recently eradicated from Green Cay (68 rats removed by live-trapping from June 2000 to February 2001; C. D. Lombard unpubl. data) and Buck Island (Witmer *et al*. 2002), although rats have recolonized Green Cay since 2005 (Lombard pers. obs.) but were absent when this study was conducted in 2002-2003. Rats are present but apparently are rather scarce on Protestant Cay and Ruth Island (McNair pers. obs.). Pre- and post-removal effects of exotic mammals on columbid nests on the two cays off St. Croix without rats cannot be compared because of the absence of pre-removal studies. Nonetheless, columbid nest placement (ground versus above-ground) on cays without rats can be compared to the two cays with rats and results therein can be compared to published studies. The number of ground nests covered by vegetation or under boulders and at other sites may increase in response to the removal of rats (Atkinson 1985, Wiley 1991, Rivera-Milan and Schaffner 2002). Green Cay and Buck Island were free of rats in 2002-2003, when breeding may have shifted from above-ground to ground nests even though reproductive success of above-ground nests on large islands such as Puerto Rico with high densities of avian and mammalian predators is generally higher than in ground nests on small cays (Wiley 1991, Rivera-Milan and Schaffner 2002). In this note, we present data on columbid nest-site placement from 2002 and 2003 on four cays off of St. Croix and assess its consistency with the expectation that ground nests should be fairly numerous or at least increase on cays without rats.

STUDY AREA AND METHODS

In the course of several ongoing studies on Green Cay and the three other nearshore cays off St. Croix, we opportunistically obtained information on ground and above-ground nests (trees, shrubs, cacti) of five species of columbids (52 visits in 2002 and 2003). Ground nests as defined herein exclude nests placed in crevices of rock walls or on rock ledges above the ground but include nests placed on the ground among boulders. Vegetative descriptions for Buck Island, Green Cay, and Ruth Island, and vegetative characteristics for Protestant Cay are available (Woodbury and Little 1976, Woodbury and Vivaldi 1982, Yntema and Sladen 1987, McNair 2003). Briefly, all four cays have extensive or fairly extensive areas of open xeric forest, dry thornwoodland, or highly modified littoral woodland with exotic vegetation (Protestant Cay) except for man-made Ruth Island, where woodland is more limited in extent and the coral rubble is lightly vegetated. Small areas of mangrove wetland occur on Ruth Island and Buck Island. Grassland-scrub vegetation is more limited than woodland on all four cays but is fairly extensive on Green Cay, especially the northern half. Seabird colonies on these cays are absent or limited to low numbers of one or two species.

RESULTS

We discovered a total of six ground nests (2.1%) of Scaly-naped Pigeon (*Patagioenas squamosa*), White-crowned Pigeon (*P. leucocephala*), and Zenaida Dove on two cays (Green Cay, Protestant Cay) out of 288 nests of five species of columbids (Table 1). The proportion of ground nests was low on cays with (1.5%) or without rats (3.4%). Most of our data, other than White-crowned Pigeon at Ruth Island, were from Green Cay and Protestant Cay.

All six ground nests were discovered in early successional habitats, not in open woodland or forest. The Scaly-naped Pigeon nest on Protestant Cay that contained one fresh egg on 27 June 2002 (when an adult was flushed off the nest) was placed on soil underneath a sapling (1.5 m) wild tamarind (*Leucaena leucocephala*) 15 cm from a dilapidated rockwall near the top of a slope on hotel grounds in an

Table 1. The number of ground versus above-ground nests for five species of columbids on four cays (with rats, Ruth Island and Protestant Cay; without rats, Buck Island and Green Cay) off St. Croix, US Virgin Islands, from 2002 and 2003.

	Numbers of Ground / Above-ground Nests				
	Rats		No rats		
Species	Ruth Island	Protestant Cay	Buck Island	Green Cay	Total
Scaly-naped Pigeon		1 / 17			1 / 17
White-crowned Pigeon	0 / 107	0 / 13	0 / 2	1 / 19	1 / 141
White-winged Dove[a]	0 / 14				0 / 14
Zenaida Dove	0 / 1	2 / 41	0 / 1	2 / 45	4 / 88
Common Ground-Dove[b]	0 / 4			0 / 18	0 / 22
Total	0 / 126	3 / 71	0 / 3	3 / 82	6 / 282

[a]*Zenaida asiatica*
[b]*Columbina passerina*

area that had been cleared of vegetation three weeks earlier. One ground nest of the Zenaida Dove on Protestant Cay, discovered with two eggs on 14 May 2003, was completely shaded by a sapling wild tamarind 18 cm from the same rockwall as the Scaly-naped Pigeon nest in an adjacent area that had been cleared in November 2002. The other Protestant Cay nest, with two eggs on 3 May 2002, was placed among low herbaceous vegetation on the beach beside an abandoned unfenced tennis court. The two Zenaida Dove nests on Green Cay, discovered with two eggs each on 19 August 2002 and 29 May 2003, were underneath two shrubs *Eupatorium sinuatum* and *Oplonia spinosa* in grassland-scrub near the northeastern tip. The two eggs in the White-crowned Pigeon nest discovered on 29 May 2003 were placed under overhanging boulders on a 60° slope on the leeward side near the top of the peak of the northern tip of Green Cay; by 17 June this nest contained two large nestlings about to fledge. Except for this nest, the other five ground nests of these columbids failed, at least four during the egg stage (only the Zenaida Dove nest underneath the *Eupatorium* and *Spinosa* on Green Cay in 2002 may have survived to the nestling stage).

Some above-ground nests were placed in unusual nest-sites. One Scaly-naped Pigeon nest at Protestant Cay was located at a height of 0.5 m above ground on a dry upturned tree trunk along a steep hillside, and another nest at a height of 1.5 m was built on a coralita vine (*Antigonon leptopus*) lying on top of a large remnant trunk of a tree that had been recently cut down. One White-crowned Pigeon nest was placed on a ledge inside an open rusted hull of a ship 2.4 m above the water line, just off the shoreline of Ruth Island. Another pair of White-crowned Pigeons on Protestant Cay built a bulky nest on the top of the tip of a live banana frond that lay upon the corner of a window sill of an unoccupied dwelling 3.3 m above the ground. Zenaida Doves twice nested on the seat of a table chair (0.75 m above ground) placed 2 m inside this same dwelling. Finally, one pair of Zenaida Doves built a nest on Ruth Island (where the species is scarce) at a height of 2 m on top of a fold of a large, torn, horizontal tarpaulin that served as the roof for a temporary fishing shack.

DISCUSSION

The six ground nests plus at least seven unusual sites for above-ground nests again demonstrate flexible nest-site placement of columbids on inhabited and uninhabited cays (Rivera-Milan 1999, Rivera-Milan and Schaffner 2002). The ground nest of the Scaly-naped Pigeon on Protestant Cay is the first documented for this species, which generally nests high in large, tall trees. The minimum nest heights above ground reported for Puerto Rico were a few nests just off the ground in well supported stunted trees or shrubs in elfin forest in the Sierra de Luquillo (J. W. Wiley pers. comm.) and 1 m above ground in a sea grape (*Coccoloba uvifera*) at Flamenco, Culebra (F. F. Rivera-Milan pers. comm.). Despite considerable nest-site flexibility on nearshore cays off St. Croix, we found few columbid ground nests, even on cays without rats where rocky

and grassland-scrub habitat was available. Whereas our searches were opportunistic and uneven as to species, site, and year, we are confident that only a small proportion of columbid nests on these cays are ground nests.

The scarcity and failure of all but one of these ground nests on cays with and without rats, with or without seabird colonies (*cf.* Burger *et al.* 1991), and their restriction to early successional habitats suggest that columbids may prefer breeding aboveground when suitable nest-sites are available in more mature habitats. Predation effects by native fauna probably reduce the incidence of ground nesting on cays even where rats (and other exotic predators) may be absent, unless no other habitat is readily available on more exposed cays such as Cayo del Agua in the Culebra Archipelago or Saba Cay and Flat Cay off St. Thomas. Land crabs are probably the major predators of columbid nests on cays off St. Croix, except possibly Buck Island where the Pearly-eyed Thrasher (*Margarops fuscatus*) is fairly numerous (*cf.* Wiley 1991).

ACKNOWLEDGMENTS

We thank Hotel-on-the-Cay for providing us boat transportation to reach Protestant Cay, J. Johnson of the Tamarind Reef Hotel for providing kayaks that allowed us to reach Green Cay, Z. Hillis-Starr of the National Park Service for allowing us to reach Buck Island on their boat, and M. A. Mahoney for allowing us access to St. Croix Renaissance Park where we launched kayaks provided by W. Coles. We also thank J. W. Wiley for reviewing a penultimate draft of this manuscript and W. J. Arendt and two anonymous individuals for their reviews of the submitted manuscript. McNair also thanks the USFWS for financial support (Federal Aid Program, Pittman-Robertson Columbids Project, W12, Study 1) and Christine Willis for her support. Copies of unpublished manuscripts listed below are available from the first author.

LITERATURE CITED

ATKINSON, I. A. E. 1985. The spread of commensal species of *Rattus* to oceanic islands and their effects on island avifaunas. Pp. 35-81 *in* Conservation of island birds (P. J. Moors, ed.). ICBF Technical Publication 3. Washington: Smithsonian Institution Press.

BURGER, J., M. GOCHFELD, D. J. GOCHFELD, AND J. E. SALIVA. 1989. Nest site selection in Zenaida Dove (*Zenaida aurita*) in Puerto Rico. Biotropica 21:244-249.

BURGER, J., M. GOCHFELD, J. E. SALIVA, D. J. GOCHFELD, D. A. GOCHFELD, AND H. MORALES. 1991. Habitat use by visiting Zenaida Doves *Zenaida aurita* in Puerto Rico: avoidance of islands without nesting seabirds. Ornis Scandinavica 22:367-374.

CAMPBELL, E. W. 1991. The effect of introduced roof rats on bird diversity of Antillean cays. Journal of Field Ornithology 62:343-348.

DAMMANN, A. E., AND D. W. NELLIS. 1992. A natural history atlas to the cays of the U. S. Virgin Islands. Pineapple Press, Inc., Sarasota, FL.

MCNAIR, D. B. 2003. Population estimate, habitat associations, and conservation of the St. Croix Ground Lizard *Ameiva polops* at Protestant Cay, United States Virgin Islands. Caribbean Journal of Science 39:94-99.

NELLIS, D. W., R. A. DEWEY, M. A. HEWITT, S. IMSAND, R. PHILIBOSIAN, AND J. A. YNTEMA. 1984. Population status of Zenaida Doves and other columbids in the Virgin Islands. Journal of Wildlife Management 48:889-894.

RIVERA-MILAN, F. F. 1999. Population dynamics of Zenaida Doves in Cidra, Puerto Rico. Journal of Wildlife Management 63:232-244.

RIVERA-MILAN, F. F., AND F. C. SCHAFFNER. 2002. Demography of Zenaida Doves on Cayo del Agua, Culebra, Puerto Rico. Condor 104:587-597.

WILEY, J. W. 1991. Ecology and behavior of the Zenaida Dove. Ornitología Neotropical 2:49-75.

WITMER, G. W., F. BOYD, E. CAMPBELL, III, J. WAKEFIELD, AND Z. HILLIS-Starr. 2002. The eradication of introduced rats at Buck Island Reef National Monument, St. Croix, U. S. Virgin Islands. Final report. U.S. Department of Interior, National Park Service, Buck Island Reef National Monument, Christiansted, St. Croix, U. S. Virgin Islands.

WOODBURY, R. O., AND E. L. LITTLE, JR. 1976. Flora of Buck Island Reef National Monument (U. S. Virgin Islands). U. S. Dept. Agric. Forest Service, Institute of Tropical Forestry, Río Piedras, Puerto Rico.

WOODBURY, R. O., AND J. L. VIVALDI. 1982. The vegetation of Green Cay. U. S. Fish and Wildlife Service contract report no. CI-007-6-1. Files: Caribbean Islands National Wildlife Refuge (P. O. Box 510, Boqueron, Puerto Rico).

YNTEMA, J. A., AND F. W. SLADEN. 1987. Ruth Island survey. Final report, endangered species project ES-1, Study IIB, Job IIB-1. Division of Fish and Wildlife, U. S. Virgin Islands.