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*Photo: Lisa D. Yntema*

## Records and observations of breeding waterbirds, rare and uncommon birds, and marked individuals on St. Croix, U.S. Virgin Islands

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**Abstract** The continuation of long-term avifaunal surveys conducted on St. Croix, U.S. Virgin Islands, from August 2004 through July 2012 (8 yr) resulted in new information on 87 species, 67 of which are rare to uncommon. However, our emphasis is on site-specific documentation of 16 rare to common breeding waterbirds and 3 columbids. We also provide documentation for individuals of 10 waterbird and 1 falcon species marked in North or South America or the Caribbean that were re-sighted or recovered on St. Croix. Four individuals of two of these species (Whimbrel [*Numenius phaeopus*] and Ruddy Turnstone [*Arenaria interpres*]) migrated to St. Croix more than once. We fully document vagrant and rare transient avian species that have occurred on St. Croix fewer than 10 times and rare to uncommon species that otherwise are of historical interest. We include five species previously unknown on St. Croix: Curlew Sandpiper (*Calidris ferruginea*), Great Black-backed Gull (*Larus marinus*), Black-billed Cuckoo (*Coccyzus erythrophthalmus*), Greater Ani (*Crotophaga major*), and Fork-tailed Flycatcher (*Tyrannus savana*). Some noteworthy occurrences of rare to uncommon species were influenced by weather events. Using current data in conjunction with past records, published and unpublished, we assess changes in the status of avian species on St. Croix with respect to site-specific environmental changes. Although documented changes in the status of birds on St. Croix were sometimes the result of increased observer effort, some changes in species status were real. Some real positive changes were associated with a general increase in rainfall over the past decade. Avian species that increased in abundance and distribution since 2002 include eight waterbirds, one resident columbid, two partial migrant columbids, and one migrant parulid. While we found no clear evidence of any negative declines since 2002, species that showed a negative decline since the 1980s include one migrant larid, and three migrant landbirds, all forest species.

**Keywords** breeding, conservation, distribution, landbirds, St. Croix, waterbirds, wetlands

**Resumen** Registros y observaciones de aves acuáticas nidificantes, aves raras y poco comunes e individuos marcados en St. Croix, Islas Vírgenes de los Estados Unidos—La continuación de los muestreos de aves a largo plazo realizados en St. Croix, Islas Vírgenes de los Estados Unidos, desde agosto de 2004 hasta julio de 2012 (8 años) dio como resultado nueva información sobre 87 especies, 67 de las cuales son raras o poco comunes. Sin embargo, nuestro énfasis está en la documentación sitio-específica de 16 especies de aves acuáticas nidificantes raras y comunes y de 3 colúmbidos. También proporcionamos documentación para individuos de 10 especies de aves acuáticas y 1 falconiforme marcados en América del Norte, América del Sur o el Caribe que fueron vistos o recuperados en St. Croix. Cuatro individuos de dos de estas especies (*Numenius phaeopus* y *Arenaria interpres*) migraron a St. Croix más de una vez. Documentamos completamente las especies de aves transitorias vagrantes raras que se han registrado en St. Croix menos de 10 veces y las especies raras a poco comunes que de otro modo son de interés histórico. Incluimos cinco especies desconocidas previamente en St. Croix: *Calidris ferruginea*, *Larus marinus*, *Coccyzus erythrophthalmus*, *Crotophaga major* y *Tyrannus savana*. Algunas ocurrencias notables de especies raras a poco comunes fueron influenciadas por eventos climáticos. Utilizando datos actuales junto con registros pasados, publicados y no publicados, evaluamos los cambios en el estado de la avifauna de St. Croix con respecto a los cambios ambientales sitio-específicos. Aunque los cambios documentados en el estado de la avifauna de St. Croix fueron en ocasiones el resultado de un incremento en el esfuerzo de observación, algunos de estos cambios fueron reales. Algunos cambios positivos reales se asociaron con un aumento general de las precipitaciones en la última década. Las especies de aves que aumentaron en abundancia y distribución desde 2002 incluyen ocho aves acuáticas, un colúmbido residente, dos colúmbidos migratorios parciales y un parúlido migratorio. Aunque no se encontraron pruebas claras de un decline negativo desde 2002, las especies que mostraron una disminución negativa desde la década de 1980 incluyen un larido migratorio y tres aves terrestres migratorias, todas ellas especies de bosque.

**Palabras clave** aves acuáticas, aves terrestres, conservación, distribución, humedales, nidificación, St. Croix

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**Résumé** Mentions et observations d'oiseaux d'eau nicheurs, d'oiseaux rares et peu communs et d'individus marqués à Sainte-Croix (Îles Vierges américaines)—La poursuite de l'étude à long terme de l'avifaune de Sainte-Croix (Îles Vierges américaines), d'août 2004 à juillet 2012 (8 ans) a fourni de nouvelles informations sur 87 espèces, dont 67 rares à peu communes. Nous avons toutefois mis l'accent sur la documentation à l'échelle des sites pour 16 oiseaux d'eau nicheurs, rares à communs, et trois colombidés. Nous fournissons également des informations sur 10 espèces d'oiseaux d'eau et une espèce de faucon dont des individus marqués en Amérique du Nord, en Amérique du Sud ou dans les Caraïbes ont été contrôlés ou repris à Sainte-Croix. Quatre individus de deux de ces espèces (Courlis corlieu [*Numenius phaeopus*] et Tournepierre à collier [*Arenaria interpres*]) ont migré plus d'une fois jusqu'à Sainte-Croix. Nous documentons entièrement les espèces vagabondes et rares observées moins de 10 fois à Sainte-Croix et les espèces rares à peu communes présentant un intérêt historique. Nous mentionnons cinq espèces jusqu'alors inconnues à Sainte-Croix : le Bécasseau cocorli (*Calidris ferruginea*), le Goéland marin (*Larus marinus*), le Coulicou à bec noir (*Coccyzus erythrophthalmus*), l'Ani des palétuviers (*Crotophaga major*) et le Tyran des savanes (*Tyrannus savana*). Certaines apparitions remarquables d'espèces rares à peu communes étaient liées à des événements météorologiques. En utilisant les données actuelles en conjonction avec des données antérieures, publiées et non publiées, nous évaluons les changements du statut des espèces d'oiseaux à Sainte-Croix par rapport à des changements environnementaux à l'échelle des sites. Bien que les changements documentés du statut des oiseaux à Sainte-Croix soient parfois liés à une augmentation de l'effort d'observation, certains d'entre eux sont bien réels. Des changements positifs réels peuvent être associés à une augmentation générale des précipitations au cours de la dernière décennie. Parmi les espèces d'oiseaux dont l'abondance et la répartition ont augmenté depuis 2002, se trouvent huit oiseaux d'eau, un colombidé présent toute l'année, deux colombidés partiellement migrateurs et une paruline migratrice. Bien que nous n'ayons trouvé aucune preuve manifeste de déclin négatif depuis 2002, les espèces qui ont affiché un déclin négatif depuis les années 1980 comprennent un laridé migrateur et trois espèces forestières terrestres migratrices.

**Mots clés** conservation, oiseaux d'eau, oiseaux terrestres, répartition, reproduction, Sainte-Croix, zones humides

St. Croix, with an area of 215 km<sup>2</sup>, is the largest of the three main U.S. Virgin Islands (USVI) and is separated from the northern USVI and British Virgin Islands by the Virgin Islands Trough in the Caribbean Sea. Although St. Croix lies approximately 60 km to the south, its avifauna, like that of the northern Virgin Islands, has both Greater and Lesser Antillean elements (Robertson 1962). With its rich mosaic of multiple shallow saline and freshwater wetlands, St. Croix is a suitable small Caribbean island on which to document the relationship between fluctuations in the timing and quantity of rainfall and the onset, duration, and success of breeding birds in these habitats.

Approximately 438 ha of saline (including brackish) wetlands now exist on St. Croix. Industrial development on the south shore in the early 1960s filled most of Krause Lagoon, once the island's premier wetland habitat, leaving just a remnant of the original 260 ha (Norton and Seaman 1985, McNair et al. 2006a). Only a few of the extant saline wetlands are currently protected (Southgate Pond, Sugar Bay mangrove forest, and University of the Virgin Islands Wetland Reserve). Some are partially protected (Great Pond, Salt River, and West End Salt Pond), but several are threatened by planned developments (Great Pond in spite of partial protection, Mount Fancy Salt Pond, and William-Prosperity Marsh). Despite ongoing degradation at some sites, most saline wetlands are still used by a diversity of local (sedentary) and migratory avian species. This study provides additional confirmation that Southgate Pond (18 ha) along the northeastern shore and Great Pond (50 ha) along the southeastern shore are the two best extant wetlands for birds on St. Croix (Sladen 1992, Gaines and Crawford 2004, McNair and Cramer-Burke 2006, McNair et al. 2006a, 2006b).

St. Croix also contains over 125 freshwater ponds that provide important habitat for local and migratory waterbirds and land-

birds (McNair et al. 2005). These ponds, built mostly on farmland since the early 20th century, were primarily intended to provide water for livestock and to replenish the water table. None, not even the reservoirs, are afforded any true protection. The period of our avifaunal surveys documented herein ends with the period of sharp decline of the dairy livestock industry on St. Croix, along with the continued drop in the number of pasture-raised beef cattle and sheep herds, thus providing timely benchmark data on the site-specific importance of freshwater farm ponds on St. Croix.

A 34-km elongated, narrow triangle lying on an east-west axis, St. Croix's landscape is influenced by the easterly trade winds, with dry shrubland in the east and moist forest in the upland hills of the northwest. In between, gently undulating agricultural lands, active and inactive pastures, dry secondary forests, and guts (gullies or stream beds, perennial or intermittent, and surrounding mesic drainage forest; McGuire 1925, Imsand and Philibosian 1987) add to the range of terrestrial habitats used by resident and migratory landbirds. As with the freshwater ponds dispersed throughout much of the island, few terrestrial habitats outside of United States National Park Service (USNPS) and United States Fish and Wildlife Service (USFWS) lands are protected. Autumn weather including storms and hurricanes may influence the appearance and numbers of uncommon and rare migratory landbirds. Certainly the amount of autumn rainfall and damaging storm winds affect the quality and availability of the assorted habitats and food sources used by migratory landbirds on St. Croix. However this study did not specifically analyze these factors. This paper provides site-specific information on 87 avian species in wetland, marine, and terrestrial environments on St. Croix, including new information from long-term avifaunal surveys from 2004 to 2012. We document the relationship

between fluctuations in rainfall and the timing and duration of breeding of waterbirds and some landbirds in those habitats. We also detail the occurrence of scarce species, vagrants, and unusually large flocks, which in some cases may have been influenced by wind and heavy rainfall events. Finally, we document marked birds that were re-sighted or recovered on St. Croix.

The continued monitoring of bird populations is especially critical to informing the protection of habitats and conservation of scarce species, some of which may be declining, on small islands such as St. Croix. Degradation or destruction of even a few sites on which these birds depend could seriously diminish the island's avian biodiversity.

## Methods

### Avifaunal Surveys

St. Croix has an impressive, though intermittent, ornithological record which began in the late 1850s with the work of A. and E. Newton (Newton and Newton 1859a, 1859b, 1859c, 1859d, McNair *et al.* 2005). The first year-round, decadal-length avifaunal surveys on St. Croix were conducted in the 1980s (Sladen 1987, 1988, 1992, Wauer and Sladen 1992, Wauer and Wunderle 1992) and were followed more recently by year-round surveys initiated in 2002 (McNair 2005, McNair *et al.* 2005, McNair and Cramer-Burke 2006, McNair and Lombard 2006, McNair *et al.* 2006a, 2006b, McNair 2008a, 2008b, McNair *et al.* 2008). With the primary focus on breeding waterbirds, McNair *et al.* (2005) documented occurrences of 62 of St. Croix's species through July 2004. This paper contains new information from continued avifaunal surveys conducted from August 2004 through July 2012. We include unpublished and published data from surveys and other historical data when applicable and available, thereby providing comprehensive accounts for species not recently or thoroughly documented. We used relevant data from published papers on landbird surveys conducted in the northern USVI, northern Lesser Antilles, and Puerto Rico to show comparative species status on the nearest neighboring islands. Terms used for abundance and frequency generally follow Robertson and Woolfenden (1992).

Our surveys focused on saline (including brackish) and freshwater wetlands, and Ruth Island (a 7.5 ha cay formed about 350 m off the industrial southern shore from dredged spoil material in 1965), with less time spent on the other three offshore cays, shoreline habitats, and upland areas. We conducted area searches at wetland sites, walking around pond perimeters or wading or canoeing into wetlands to explore suitable habitat. A few freshwater ponds were not visited during this study due to interruption of access (Catherine's Rest South Pond, Schuster East Pond, and Sugar Bay Pond) or because they no longer existed (Frangipani West Pond in Libanon Hill). A significant man-made change occurred at Southgate Pond when the causeway on the pond's west side was repaired (completed in May 2011). This structural repair sharply reduced pond water leakage through the causeway and curtailed loss of water via overflow following heavy rains. Although it was not the intended purpose, the pond's maximum water level was raised by approximately 15 cm.

We conducted comparatively fewer surveys in upland habitats, focusing on the more elevated, more moist, and less pop-

ulous northwestern hills of St. Croix. Upland areas were mainly surveyed by walking along guts, through pastures, or on secondary roads. We walked along select shorelines, but in contrast to the surveys of FWS in the 1980s, we did not conduct any pelagic seabird surveys.

### Species Accounts

The results are organized into species accounts. Observations of the eight co-authors are attributed in the text using the observers' initials. The remaining observations are those of other biologists and reliable observers and are credited in the text. Photographs used to verify reports but not reproduced herein were examined by LDY.

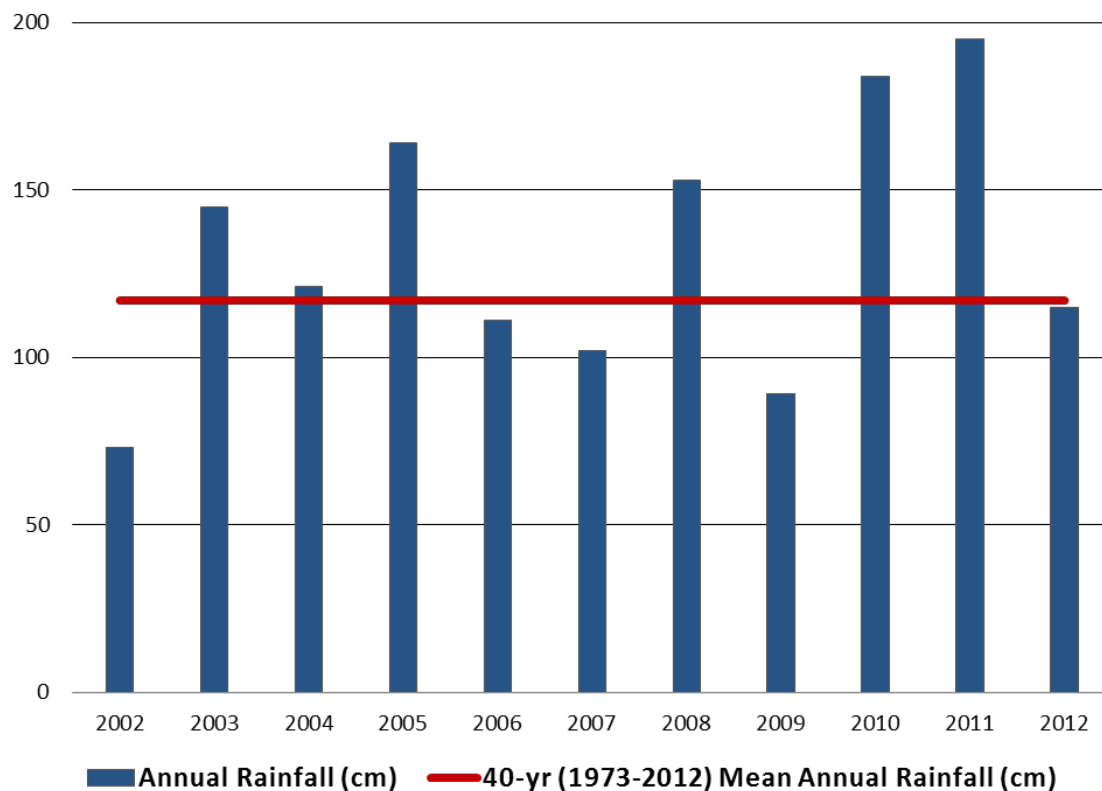
We obtained information on marked birds re-sighted or recovered on St. Croix from the following researchers and organizations: Bandedbirds (Bandedbirds.org); C. Weseloh (Canadian Wildlife Service-Ontario Region); F. Smith and B. Watts (The Center for Conservation Biology, College of William and Mary); New Jersey Department of Environmental Protection, Division of Fish and Wildlife (NJDFW); J. Pierce (V.I. Department of Planning and Natural Resources, Division of Fish and Wildlife); USGS Bird Banding Laboratory (USGS-BBL); and V.I. Department of Planning and Natural Resources, Division of Fish and Wildlife (VIDFW). We cited the researcher by name when we communicated directly with that individual concerning his or her own work.

Cited specimens in museum collections were accessed through electronic databases and correspondence with individual curators at the following institutions: Academy of Natural Sciences of Drexel University, Philadelphia, PA (ANSP); Field Museum of Natural History, Chicago, IL (FMNH); University Museum of Zoology, Cambridge, UK (UMZC); and United States National Museum, Smithsonian Institution, Washington, DC (USNM; now known as the National Museum of Natural History). See Appendix 1 for further clarification.

Site names generally follow McGuire (1925), Imsand and Philobosian (1987), the Official Road Map of the United States Virgin Islands (Government of the Virgin Islands of the United States 1996), and McNair *et al.* (2005, 2008). Ponds and other wetland sites are discrete geographic entities (e.g., Great Pond) that may include adjacent habitat such as an associated beach berm. Man-made freshwater farm ponds and seepage ponds are generally named by these authors for the estate in which the ponds occur or in a few cases for the land owner. A cardinal direction (e.g., north, east) or an elevational description (e.g., upper, middle) is added to pond names when required to differentiate between several ponds in the same area. Estate names (e.g., Jolly Hill, William, Canegarden) are used to identify most terrestrial sites. Mannings Bay wetland complex (McNair *et al.* 2006a), located on the southwest shore, is a 10 ha wetland with dense mangrove stands between the two main ponds. For the purpose of this paper, Mannings Bay East Pond, the deeper pond, and Mannings Bay West Pond, the shallower pond, are separated from Mannings Bay wetland complex. Finally, collection location names of some museum specimens could not be decisively matched with current site or estate names. Those original specimen collection location names are placed in quotes.

The names of some locations have changed over time. Univer-





**Fig. 1.** Annual St. Croix rainfall (cm) from 2002 to 2012 compared to the 40-yr average (data from Bethlehem Upper New Works Station, Agricultural Research Service, USDA, St. Croix).

sity of the Virgin Islands (UVI) was originally College of the Virgin Islands, HOVENSA oil refinery was formerly Hess Oil Virgin Islands Corporation, and St. Croix Renaissance Park successively carried the name of each of the four different aluminum companies that owned and operated the aluminum refinery at that location. In order to avoid confusion about the actual locations where observations occurred, current names are used for all locations, even when citing older data.

### Rainfall Data

St. Croix is generally drier on the eastern end than the western end (Gaines 2004). Historical long-term rainfall data (1852–1920), averaged from three low-elevation sites on the western, middle, and eastern ends of St. Croix, document two wet periods, one in spring and the other in autumn (Fig. 10 in Gaines 2004). The timing and intensity of the wet periods are subject to considerable variation, but are typically highest and most prolonged in autumn (peak in October; c. 17.0 cm), with a shorter secondary peak in spring (May; c. 11.5 cm). Rainfall is typically lowest during winter (January to March; c. 4.5–6.0 cm each month).

The rainfall data used in this document were collected at a weather station at a low elevation (61 m above sea level) in an agricultural field at the Bethlehem Upper New Works, Agricultural Research Service, U.S. Department of Agriculture (USDA). We consider its mean annual rainfall data to be the best representation of island-wide rainfall because of this station's central location on St. Croix. Two months of the USDA station rainfall data from 2008 are missing, so rainfall data from three nearby stations were averaged and used in place of that missing data.

These weather stations, all within 3.5 km of the USDA station, are at the adjacent Sheep Research Facility, Agricultural Experiment Station, UVI (AES-UVI); at the HOVENSA refinery; and at the Henry E. Rohlsen Airport (formerly the Alexander Hamilton Airport).

## Results

### Rainfall Data

Annual rainfall on St. Croix from 2002 to 2012 was higher than the 40-yr (1973–2012) mean annual rainfall (117 cm) in 6 of those 11 yr (55%; Fig. 1), and more than 30% above the 40-yr mean in four of those years (2005, 2008, 2010, and 2011). Annual rainfall in 2010 and in 2011 exceeded 180 cm, more than 50% above the 40-yr mean. The only comparable year from 1973 to 2001 was 1979, when annual rainfall was 211 cm. The period from 2002 to 2012 had 14 months with exceptionally heavy rainfall, once in spring (May 2011), four times during summer (June 2010 and 2011, July 2010, and August 2011), and nine times during autumn (September 2004 and 2008; October 2005, 2006, 2007, 2008, and 2010; and November 2003 and 2010).

In contrast, the 1980s, when FWS and associates made their observations, was a dry decade on St. Croix. Only 2 (1981 and 1987) of those 10 yr (20%) had annual rainfall that exceeded the 40-yr (1973–2012) mean annual rainfall of 117 cm, with both years less than 20% above the mean. Furthermore, that decade only had 8 months with exceptionally heavy rainfall, once in spring (May 1981), twice in summer (June 1987 and August 1989), and five times during autumn (September 1989, October 1985, November 1984 and 1987, and December 1981).

### Species Accounts

***Dendrocygna autumnalis* (Black-bellied Whistling-Duck).—**Four adults at Fredensborg Pond, the largest freshwater pond on St. Croix (2.95 ha), from 11 April through 3 June 2006 (LDY, SLF, CCB; Fig. 2) provided the first extant record for St. Croix (though see below). The whistling-ducks fed and roosted on a temporary muck bar comprised of the decaying remains of invasive water lettuce (*Pistia stratiotes*). On 1 and 3 June, respectively, the birds flew in at 0700 and 0745, indicating they were also using an unknown site (LDY, CCB). At Southgate Pond, the second extant record was of one bird present on 6 and 9 September 2008 (CCB, LDY; Appendix 2.1). Previously, Beatty (1930) shot one Black-bellied Whistling-Duck at Southgate Pond on 18 May 1919 but the whereabouts of the specimen is unknown. Seaman (1973) referred to this species as a rare straggler on St. Croix during the early 1900s, but no specific reports were documented.

***D. arborea* (West Indian Whistling-Duck).—**An adult was observed standing on dry-ki (trees killed by storms) at Mannings Bay East Pond on 21 October 2011 and roosting at the same location on 21 January 2012 (LDY). A single bird was photographed at nearby Mannings Bay West Pond on 17 February and 29 June 2012 (LDY; Fig. 3). At Southgate Pond, an adult was loosely associated with a flock of Blue-winged Teal (*Spatula discors*) on 8 March 2012 (CCB). Most likely all the above occurrences were of the same individual, providing the second record on St. Croix since 1941. Previous USVI occurrences of this former resident are summarized in McNair et al. (2005).

***D. bicolor* (Fulvous Whistling-Duck).—**One individual, likely the same bird documented at the Buccaneer Hotel Golf Course ponds on 13–30 July 2004 (McNair et al. 2005), was re-sighted at those ponds from 17 August through 16 September 2004 (CCB; Appendix 2.2) and on 27 April 2005 (LDY, SLF, CCB). A Fulvous Whistling-Duck present at Southgate Pond from 14 October through 29 December 2004 and again from 2 February through



Fig. 2. Two of four adult Black-bellied Whistling-Ducks at Fredensborg Pond on 11 April 2006. Photograph by L.D. Yntema.

25 May 2005 (CCB, DBM, LDY, SLF) was also likely the same bird. Thus this individual, the second St. Croix record and fifth occurrence, apparently remained on the island for almost 1 yr. Previous occurrences of Fulvous Whistling-Ducks are summarized in McNair et al. (2005).

***Spatula discors* (Blue-winged Teal).—**Blue-winged Teal, common on St. Croix from September to April, form pair bonds in the spring before reaching their breeding grounds (Rohwer et al. 2002). We documented unusual observations of at least one healthy male in alternate plumage remaining with an injured, non-volant female for two consecutive summers on St. Croix, rather than migrating north to its breeding grounds (LDY). The female was first observed at Annaly Pond on 27 May 2010. She remained at this site throughout the year and into the following spring when an adult male was observed with her on 14 May



Fig. 3. Adult West Indian Whistling-Duck at Mannings Bay West Pond on 17 February (left) and 29 June 2012 (right). Photographs by L.D. Yntema.

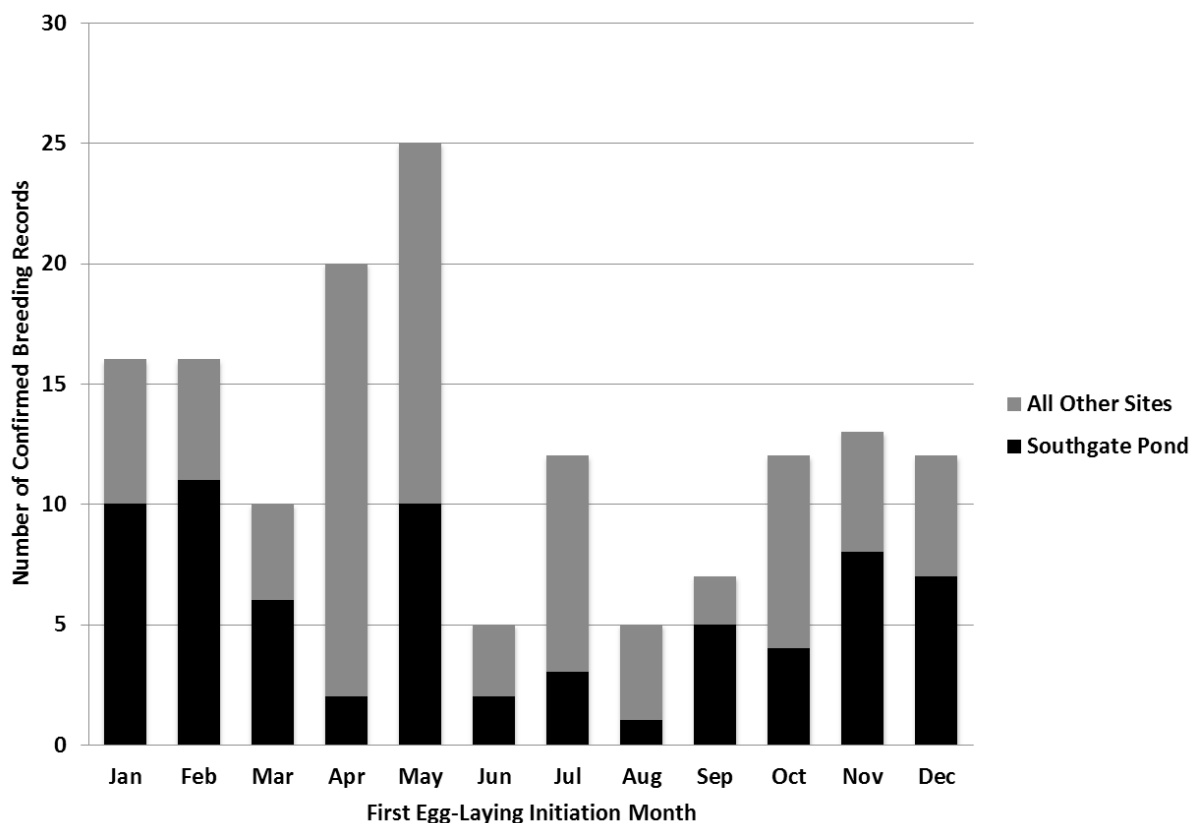


Fig. 4. The number of confirmed White-cheeked Pintail breeding records by month at Southgate Pond and all other sites combined on St. Croix, U.S. Virgin Islands, from April 2002 through July 2012.

2011. The pair remained at Annaly Pond into autumn when it could not be distinguished from seven other Blue-winged Teal on 5 November 2011. A pair, probably the same couple, was present at Annaly Pond until at least 3 July 2012.

***Anas bahamensis* (White-cheeked Pintail).**—White-cheeked Pintail breeding was confirmed at five of St. Croix's saline wetlands and three cays from April 2002 to December 2004 (McNair *et al.* 2006a). One saline breeding site was inadvertently omitted, the Buccaneer Hotel Golf Course putt hole 4 pond where three flightless juveniles were accompanied by an adult on 23 March 2004 (LDY). Since January 2005, breeding was confirmed at three additional saline sites: Rust-op-Twist Salt Pond where three half-grown juveniles were accompanied by adults on 28 July 2005 (LDY, SLF), Krause Lagoon Remnant where a brood of six 1-week old young were observed (LDY), and UVI Wetlands Reserve where five young were with an adult pair on 23 June 2010 (LDY). Breeding was also confirmed at 34 of the 84 freshwater wetlands where this species occurred from April 2002 through July 2012 (DBM, LDY, CCB, SLF). Thus, White-cheeked Pintails were confirmed breeding at 46 sites (34 freshwater, 9 brackish, and 3 cays) on St. Croix from April 2002 through July 2012.

Families of White-cheeked Pintails may move among water bodies during brood rearing before first flight of young occurs at 45–60 days (Sorenson 2005). It is highly likely that families at the more isolated water bodies on St. Croix nested where they were observed, although families at less isolated sites may have nested at an adjacent site. Regardless, we enumerate herein confirmed breeding records of adults with dependent broods as

occurring at the site where documented, thereby providing a fair approximation of their true breeding distribution. We devised a crude method to estimate the age of young of different sizes using values from the congeneric Northern Pintail (*A. acuta*) whose age at first flight (46–57 days) is virtually identical to the White-cheeked Pintail (following Southwick 1953 in Clark *et al.* 2014). The mean values of the increase in mass of young from day 1 since hatch to day 49 is a highly significant straight line ( $R^2 = 0.98$ ,  $p < 0.001$ ), allowing us to crudely estimate brood age based on size of the young. Our field observations of White-cheeked Pintails on St. Croix indicated young four-fifths grown or larger could fly. Thus, we selected the midpoint of age at first flight, 52 days, to represent young four-fifths grown. From this value, we used the size of young observed in the field to represent age since hatch. For example, a brood two-fifths grown was estimated to be 26 days old since hatch date. In order to determine approximate date of first egg laid for a given brood, we estimated the hatch date using the above brood aging method and then backdated 33 days to account for an incubation period of 25 days plus a day for each egg laid in a mean clutch size of eight (Sorenson 2005). This correction for breeding stage and clutch initiation date, while crude, yields more realistic results than using uncorrected raw data. We ignored records of families with broods four-fifths grown or larger or families without estimated size of young, although they probably represent local breeding records.

White-cheeked Pintails may nest throughout the year on St. Croix ( $n = 153$ ; Fig. 4): at Southgate Pond ( $n = 69$ ) and at all other



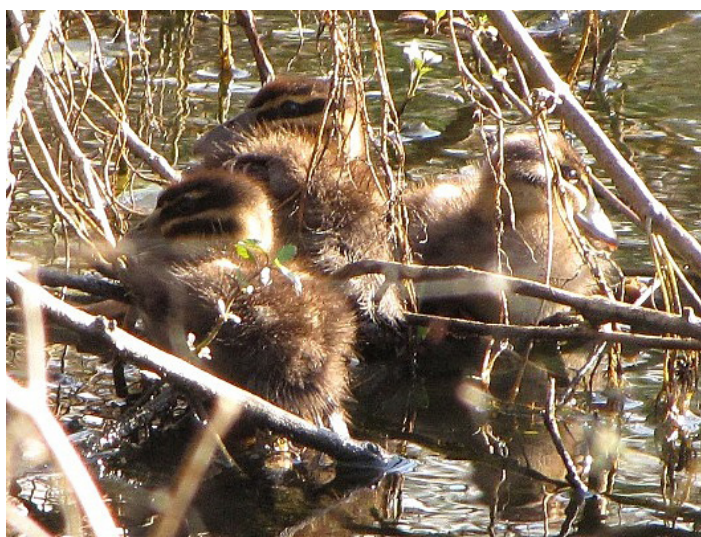


Fig. 5. Three Masked Duck young at Prosperity Pond on 3 February 2011. Photograph by L.D. Yntema.

sites combined ( $n = 84$ ). The 84 non-Southgate records included 64 at freshwater ponds, 16 at brackish sites, and 4 on cays. Most confirmed breeding records on St. Croix have been documented from autumn through spring with the peak in spring (Fig. 4), even though the highest rainfall in most years occurs during autumn with a secondary spike in the spring. Although White-cheeked Pintails may use rainfall as a proximate cue for breeding (Sorenson 2005), their spring nesting peak on St. Croix indicates that other factors (e.g., food availability) may also influence the timing of nest initiation (Sorenson 1992). At Southgate Pond, a seasonal salt pond, suitable water depths above the dry bed generally ranged from 43.5–114.5 cm (median = 62.0 cm) when salinities ranged from 4–15 ppt (median = 11 ppt;  $n = 31$ ; Spearman's  $r = -0.83$ ,  $p < 0.001$ ); salinities measured at four other brackish sites with confirmed breeding records were within the same range, from 5–14 ppt ( $n = 8$ ). The near-outlier high salinity value at Southgate Pond (21 ppt), plus the high water level value (133.5 cm) requires confirmation. Other than brackish Southgate Pond, the most favorable freshwater breeding site on St. Croix has been the Buccaneer Hotel water treatment plant ( $n = 9$ ) that

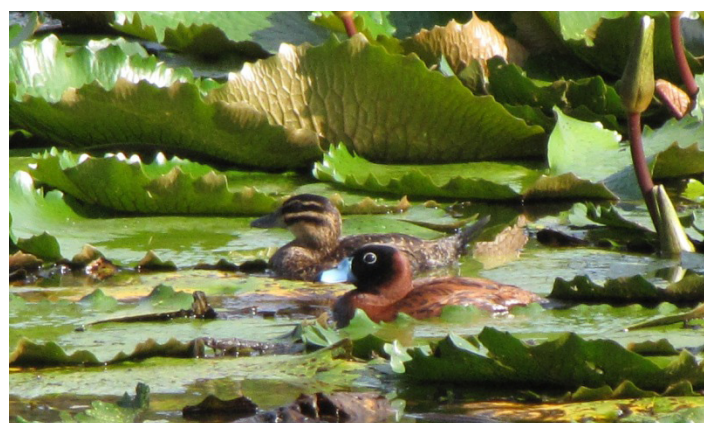


Fig. 6. Adult pair of Masked Ducks in alternate plumage at Prosperity Pond on 14 May 2011. Photograph by L.D. Yntema.

has many of the characteristics of a small, managed impoundment. Excluding Southgate Pond, however, no significant difference in the number of confirmed breeding records occurred between brackish and freshwater sites on St. Croix (median = 2 for both breeding site types; two-tail Mann-Whitney  $U = 155$ ,  $p = 0.50$ ).

***Lophodytes cucullatus* (Hooded Merganser).**—The third record and fifth occurrence of Hooded Mergansers on St. Croix was two females at Coakley Bay Salt Pond on 20 December 2008 that remained until 10 February 2009 (CCB, LDY; Appendix 2.3). A single female photographed at Great Pond on 28 December 2010 (LDY; Appendix 2.4) provided the fourth record and sixth occurrence. Previous occurrences are summarized by McNair et al. (2005).

***Nonyx dominicus* (Masked Duck).**—The first confirmed breeding record for the USVI was a pair of Masked Ducks that nested at Prosperity Pond, St. Croix, in 2011 (LDY, CCB, and G. Groner). A brood of three juveniles about 7–14 days old was accompanied by an adult female and three adult males on 3 February 2011 (LDY; Fig. 5). All birds were still present on 21 March, but only five birds remained on 23 May (LDY, CCB; Fig. 6). Thereafter, only one adult male in alternate plumage remained through 30 July 2011 (LDY, CCB). After being absent during the latter part of 2011, Masked Ducks returned to Prosperity Pond in 2012. One to six adults (up to four males and two females) were observed from 6 January to 12 July 2012 (Fig. 7), but breeding was not confirmed (LDY, CCB).

Non-breeding birds were present at three small freshwater ponds (< 0.2 ha) that contained dense vegetation including emergent grasses: 1) Prosperity Pond, where an adult male in alternate plumage was observed on 15–16 November 2005 (LDY, SLF, CCB; Appendix 2.5); 2) Upper Love Pond, where an adult female was observed on 10–11 April 2008 (LDY, CCB; Appendix 2.6); and 3) Longford Lower Pond, where an adult male in alternate plumage was observed on 3 December 2010 (LDY; Appendix 2.7) and again on 22 February 2012.

Before 2005, the only documented record of the Masked Duck in the USVI was a female collected at an Upper Love pond on 15 March 1957 (ANSP 169881; Seaman 1958). Eitniear and Colón-López (2005) reviewed recent observations (1997–2004) of Masked Duck in the Caribbean, but did not present any informa-

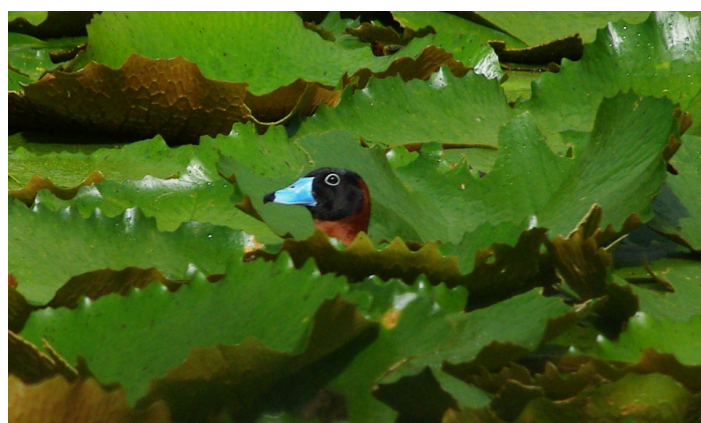


Fig. 7. Male Masked Duck in alternate plumage at Prosperity Pond on 11 May 2012. Photograph by L.D. Yntema.



**Table 1.** Occurrence and breeding of the Ruddy Duck at Southgate Pond from July 2006 through July 2012.

Dates	Occurrence				Breeding Information					
	Months <sup>a</sup>	Adults <sup>b</sup>	Males <sup>c</sup>	Females <sup>c</sup>	Sex Unknown	Confirmed	Period <sup>d</sup>	Documented Nests	Broods	Brood Size
22 Nov 2006–25 May 2007	6	1–18	10	7	1	yes	Jan–Mar	8	2	1, 2
1 Nov 2007–2 Apr 2008	5	2–16	9	7		yes	Nov–Feb	5	3	5, 1, 3
2 Jun 2008	1	1	1			no				
26 Sep 2008–8 Apr 2009	6	2–26	15	15		yes	Nov–Feb	5	0	0
14 Nov 2009–5 Apr 2010	5	1–24	13	11		no				
5 Jul 2010–24 Jul 2012	25	2–36	17	20		yes	Jan–May 2011 Aug–Oct 2011	0 0	3 1	1, 2, 4 4

<sup>a</sup>Number of months is calculated to the nearest 30-day period.

<sup>b</sup>Range of daily counts

<sup>c</sup>Maximum daily count

<sup>d</sup>Breeding period is based on active nests or dependent juveniles, with extrapolations based on approximate incubation stage of eggs and estimated age of juveniles.

tion from the USVI. Numbers were greatest in Puerto Rico and Guadeloupe, and were low elsewhere in the Caribbean. Since detection of the cryptically marked female and young of this species is made difficult by their tendency to hide in dense pond vegetation (Appendix 2.6), the St. Croix breeding population may be higher than indicated by the paucity of records.

***Oxyura jamaicensis* (Ruddy Duck).**—Breeding records of Ruddy Ducks on St. Croix before June 2006 are documented and reviewed in McNair *et al.* (2006b). Since then, Ruddy Ducks have continued to regularly occur at Southgate Pond, their primary site on St. Croix. They typically remain at Southgate for 5–6 months, from autumn into spring, with documented breeding periods ranging from 3 to 5 months (CCB, LDY, and U. Toller; Table 1). The longest uninterrupted span of occurrence was 25 months, from July 2010 through at least July 2012, when breeding was confirmed during two separate periods. The largest number of birds (36) was present on 24 July 2012 (Table 1). The larger population and persistence of Ruddy Ducks at Southgate Pond during this period were due to favorably high water levels from above average annual rainfall (Fig. 1) coupled with the increased water capacity of the pond after the repair of the retaining causeway in May 2011. The sex ratio of adults has been balanced.

A total of 18 nests and 9 broods, ranging in size from one to five dependent juveniles, were documented at Southgate Pond from July 2006 to July 2012 (Table 1). As before (McNair *et al.* 2006b), the majority of clutches (11 of 18) were found in low bowl-like crotches formed by the roots of adjoining white mangroves. No nest material was added to those nests. Nests in white mangrove crotches are susceptible to flooding when water levels rise, and because Ruddy Ducks have difficulty walking (Brua 2002), nests may be inaccessible to this diving duck when water levels fall below the level at which the brooding duck can clamber in and out of her nest. Thus, nest success in white mangrove root bowls is dependent on water levels remaining within a narrow range. Of the other Ruddy Duck clutches, six were laid in old American Coot (*Fulica americana*) nests in February 2007,

December 2007, and November 2008 (CCB; Appendix 2.8), and one clutch was found in an old Common Gallinule (*Gallinula galeata*) nest in January 2009 (CCB, U. Toller, and LDY; Appendix 2.9). Observations and nest searches were inadequate to determine hatching success of most nests.

During the first half of the 20th century, Ruddy Duck breeding on St. Croix was confirmed at only one saline site, Rust-op-Twist Salt Pond (Seaman 1973; also see McNair *et al.* 2006b). Nesting at Southgate Pond was first documented on 22 March 2005 (McNair *et al.* 2006b). We have since confirmed breeding at a new saline site, Coakley Bay Salt Pond, where a pair with three dependent, three-fifths grown juveniles was observed on 10 March 2011 (LDY, CCB). Earlier, 2–16 birds were observed at this pond from 16 August 2010 to 4 March 2011, and 3–25 individuals were present from 23 June until 24 September 2011 (LDY, CCB); their maximum number of 25 was on 26 August 2011 (LDY). Elsewhere, we documented non-breeding occurrences of Ruddy Ducks at two new saline sites on St. Croix. Single males were seen at UVI Wetlands Reserve on 23 June 2010 (LDY) and at Mount Fancy Salt Pond on 5 November 2010 (LDY).

Ruddy Ducks were documented at five freshwater sites from 2002 to 2006 (McNair *et al.* 2006b). However, the occurrence of an adult pair observed on 30 December 2004 at Granard Middle Pond (LDY, SLF), a sixth freshwater site, was overlooked. Ruddy Ducks were not observed at any additional freshwater ponds after June 2006.

***Tachybaptus dominicus* (Least Grebe).**—Least Grebe breeding on St. Croix was first confirmed in 2002 (McNair *et al.* 2005). During the next 5 yr, through March 2007, breeding was confirmed at 7 sites (5 freshwater and 2 saline) with non-breeding occurrences at 15 other sites (McNair *et al.* 2008). From April 2007 to July 2012, Least Grebes nested at 18 sites (17 freshwater and 1 saline), with non-breeding occurrences at 26 other sites (LDY, CCB, SLF, CDL, JMV; Table 2). However, during those 5 yr, Least Grebes were not observed at eight sites where they had occurred before, including one previously confirmed breeding site, William-Prosperity Marsh.

**Table 2.** Occurrence and breeding information of the Least Grebe on St. Croix from April 2007 through July 2012.

Site name	Number of Visits to Site	Number of Visits When Present	Years Present	Number of Months Present <sup>a</sup>	Number of Birds <sup>b</sup>	Confirmed Breeding	Number of Nests Observed	Number of Broods	Number of Dependent Juveniles
<i>Freshwater Sites</i>									
William Pond	86	71	2007–2012	46	1–5	yes	12	7	14
Hogensborg West Pond	27	25	2007–2012	35	1–5	yes	6	11	20
Windsor North Pond	19	17	2007–2009	18	2–5	yes	3	5	11
Windsor North Pond	3	2	2011	2	2–3	no			
Petronella Pond	11	9	2007–2009	11	1–5	yes	3	1	3
Petronella Pond	3	1	2011	2	4	yes	1	2	3
Mountain Mint Dairy Lower Pond #2	12	10	2007–2009	11	1–4	yes	4	2	4
Mountain Mint Dairy Upper Pond #2	10	7	2007–2009	9	1–5	yes	1	2	5
Mountain Mint Dairy Upper Pond #3	13	7	2007–2011	9	1–2	yes	1	1	1
Mountain Mint Dairy Upper Pond #1	8	5	2007–2008	5	1–2	yes	1		
Brookshill Pond	21	7	2007–2008	4	1–2	yes	1		
Mountain Mint Dairy Upper Pond #4	4	2	2007	2	1	no			
Mountain Mint Dairy Upper Pond #4	3	2	2009–2010	2	1	no			
Castle Nugent Lower Pond	5	2	2007	2	2	no			
Castle Nugent Lower Pond	2	1	2009	1	1	no			
Windsor Marsh	8	2	2007	2	1	no			
Lowry Hill Road South Slough	6	3	2007	1	2	no			
Lowry Hill Road South Slough	4	1	2011	1	1	no			
Windsor South Pond	8	1	2007	1	1	no			
Schuster Upper Pond	3	1	2007	1	1	no			
Schuster East Pond	1	1	2007	1	1	no			
Out-of-Sight Pond	1	1	2007	1	1	no			
Hermitage Pond	18	13	2008–2012	16	1–4	yes	2	2	3
Frangipani East Pond	7	1	2008	1	2	no			
Frangipani East Pond	9	7	2011–2012	6	4–10	no			
Lowry Hill Road North Pond	5	3	2008	3	1	no			
Lowry Hill Road North Pond	5	2	2012	1	2	no			
Many Paws Pond	4	1	2008	2	2	yes	1		
Many Paws Pond	1	1	2011	1	1	no			
Sight South Pond	4	2	2008	2	2	no			
Carlton North Pond	9	1	2008	1	1	no			
Triton Bay Pond	2	1	2008	1	1	no			
Mount Victory Pond	3	1	2009	1	1	no			
Mount Victory Pond	7	7	2011–2012	12	1–6	yes	3	3	7
Aermotor North Pond	2	1	2009	1	3	no			
Aermotor North Pond	2	2	2011	2	2	yes	1		
Coble Pond	3	1	2009	1	1	no			
False Schuster Pond	2	1	2009	1	1	no			
Cockpit Pond	1	1	2009	1	1	no			

<sup>a</sup>Calculated to the nearest 30-day period, with extrapolations based on approximate incubation stage of eggs and estimated age of juveniles.

<sup>b</sup>Includes adult and immature birds  $\geq 4/5$  grown.

Table 2. cont.

Site name	Number of Visits to Site	Number of Visits When Present	Years Present	Number of Months Present <sup>a</sup>	Number of Birds <sup>b</sup>	Confirmed Breeding	Number of Nests Observed	Number of Broods	Number of Dependent Juveniles
<i>Freshwater Sites</i>									
Sight North Pond	3	2	2010	2	1–2	yes	1		
Longford Lower Pond	8	1	2010	1	1	no			
Longford West Pond	4	1	2010	1	1	no			
Prosperity Pond	29	29	2011–2012	19	2–4	yes	4	5	10
Creque Dam Reservoir	11	8	2011–2012	8	1–2	yes	3	1	1
Mon Bijou Northwest Pond	5	4	2011–2012	5	2–3	yes	1	1	2
Mount Fancy Pond	5	1	2011	1	1	no			
Cotton Valley Pond	3	1	2011	1	1	no			
Annaly Pond	3	3	2012	3	1–3	no			
VIDA Southwest Pond	5	5	2012	2	1–4	no			
Longford Southeast Pond	2	1	2012	1	1	no			
Coakley Pond	1	1	2012	1	1	no			
Mountain Mint Dairy Lower Pond #1	1	1	2012	1	1	no			
<i>Saline Sites</i>									
Rust-op-Twist Salt Pond	18	10	2008–2012	10	1–9	yes	6	3	8
Southgate Pond	17	1	2012	1	1	no			

<sup>a</sup>Calculated to the nearest 30-day period, with extrapolations based on approximate incubation stage of eggs and estimated age of juveniles.

<sup>b</sup>Includes adult and immature birds  $\geq 4/5$  grown.

Semi-annual surveys of indigenous waterbirds conducted on St. Croix in 2008 (Valiulis 2009) covered 125 freshwater and 29 saline sites during two 5-day periods. This study compared dry season (2–6 June) to wet season (1–5 November) populations and distributions. The dry season conditions were considered normal (25 cm of rain from 1 January to 1 June 2008). However, the rainfall and winds that accompanied Hurricane Omar, which grazed the East End of St. Croix in mid-October, resulted in atypical conditions during the November survey. Pond levels were unusually high. Survey efforts were hindered by toppled trees and shrubs that obscured some pond edges and prevented access to several sites, likely lowering the wet season's counts. During the dry season survey, 20 adult Least Grebes were recorded including eight pairs at freshwater ponds (two pairs actively breeding). During the wet season survey, 12 adult Least Grebes were recorded, including four pairs (all actively breeding) and a single adult with one dependent young. Two of the breeding pairs were at Rust-op-Twist Salt Pond. The other three breeding sites were freshwater ponds. Thus, Least Grebes showed greater breeding activity during the wet season, as expected, but were more numerous during the dry season, an unanticipated result. However, as indicated above, conditions were not typical during the wet season survey period. Subsequent counts document that Least Grebe populations did not decline (Table 2).

Over the 10-yr period from 2002 to 2012, Least Grebes occurred at a total of 51 sites on St. Croix and nested at 21 (19 freshwater and 2 saline). The remaining occurrences, exclusively non-breeding birds, were at 29 freshwater ponds and a single saline site. Freshwater ponds in which Least Grebes occurred

from 2002 to 2012 ( $n = 48$ ) ranged in size from 0.05 to 2.95 ha (Conservation Data Center 2001), with a mean size of 0.25 ha. Freshwater ponds where breeding occurred ( $n = 19$ ) had a mean size of 0.17 ha, with more of these ponds on the wetter western half of the island ( $n = 11$ ; 58%) compared to the drier eastern half ( $n = 8$ ).

The Least Grebe, which favors small semi-permanent freshwater ponds in the USVI, is particularly susceptible to fluctuations in rainfall. During the span when we documented the population growth of this species, above average rainfall in multiple years (Fig. 1) provided ample appropriate wetland habitat. It remains to be seen how the St. Croix population will react to drought conditions when pond availability is severely limited.

***Podilymbus podiceps* (Pied-billed Grebe).**—On St. Croix, Pied-billed Grebes typically occupy and breed at freshwater ponds (McNair et al. 2005, this study). However, they also regularly breed at Southgate Pond where they had a record number of 21 nests in 2011 when rainfall was abundant (Fig. 1), water levels favorable, and salinity ranged from 1 to 7 ppt at this site (CCB). During this study, breeding was confirmed at three additional saline sites (LDY, CCB): Mannings Bay East Pond (2007, 2011, and 2012), Mount Fancy Salt Pond (2011), and Rust-op-Twist Salt Pond (2011). From April 2002 to December 2004, non-breeding birds occurred at three other saline sites: Buccaneer Hotel Golf Course putt hole 4 pond, Coakley Bay Salt Pond, and William-Prosperity Marsh (McNair et al. 2006a). Pied-billed Grebes continued to use these sites after 2004, with the exception of William-Prosperity Marsh, and were also observed at two other saline wetlands, UVI Wetlands Reserve (2006 and 2008)



and Renaissance Upper Cooling Pond (2008) (LDY, SLF, CCB; Valiulis 2009).

***Phoenicopterus ruber* (American Flamingo).**—This species has been rare on St. Croix since its extirpation in the early 19th century (McNair *et al.* 2005). One American Flamingo adult was photographed in the near-shore sea shallows on the west side of Mannings Bay on 13 October 2010 in the wake of Hurricane Otto (LDY; Fig. 8). This bird was subsequently seen on the east side of the same bay on 14 and 19 October 2010 (LDY, SLF, CDL). A single adult, possibly the same individual, was also photographed at Renaissance Mangrove Remnant Wetland on 18 July 2012 (LDY; Appendix 2.10).

***Phaethon lepturus* (White-tailed Tropicbird).**—One to two pairs have continued to nest each year in the limestone cliffs at Canegarden Bay (AOL, LDY; Appendix 2.11 and 2.12), the only breeding site on St. Croix (McNair *et al.* 2005). Birds generally arrive no earlier than the first half of January, so a bird seen on 26 December 2009 (AOL) was a bit unusual. Adults continue to be seen approaching the cliff-face nest sites in June when juveniles are near fledging. A downy juvenile with no visible pin feathers observed on 10 June 2010 and last seen in its nest crevice on 12 July (AOL) was from a notably late breeding effort. High counts of seven birds flying over Canegarden Bay occurred on the three following spring dates: mid-March 2006, ages not ascertained (CDL); 22 May 2009, all adults (LDY, CCB); and 9 May 2011, all adults (LDY).

***Sula dactylatra* (Masked Booby).**—A juvenile with a severe throat tear, apparently from a fish hook injury, was found at Pelican Cove on 13 November 2008 (AOL). The bird received veterinary care but died about a week after it was found. While Masked Boobies continue to breed on Cockroach Cay and adjoining Sula Cay near St. Thomas (J. Pierce unpubl. data; Pierce 2009), the occurrence of this species on St. Croix had previously been confirmed only by a cranium found in an ancient kitchen midden near the shore in southwestern St. Croix (Wetmore 1937).

***S. leucogaster* (Brown Booby).**—Seven Brown Boobies (two chicks and five adults) originally banded at a nesting colony on Frenchcap Cay off St. Thomas (USGS-BBL; J. Pierce pers. comm.) were recovered on St. Croix from January to May during six different years ranging from 1976 to 2011. The only recovery since 2002 of this fairly common year-round visitor to St. Croix was a female, banded as an adult on 13 February 2005. It was found tangled in fishing line in Frederiksted in April 2011 (exact date unknown) and died shortly after it was rescued.

***Pelecanus occidentalis* (Brown Pelican).**—Brown Pelican nesting has been confirmed at only two sites on St. Croix and its offshore islands, Buck Island and Green Cay (McNair *et al.* 2005). Pelicans have not nested on Green Cay since 2004 despite apparent high nest success in 2003 and 2004 (CDL unpubl. data). Roughly 30 pairs have nested on Buck Island in recent years (I. Lundgren pers. comm.), but that breeding colony has not been closely monitored by the USNPS, with even fewer observations since the species was de-listed in November 2009 (USFWS 2009). Much earlier, a nesting colony of approximately 100 birds was present at the eastern end of Buck Island in January 1966 (J. Rappole unpubl. data). The joint Virgin Islands Bureau of Fish and Wildlife (now V.I. Division of Fish and Wildlife or VIDFW) and USNPS censuses of the Buck Island pelican rookeries from 1975

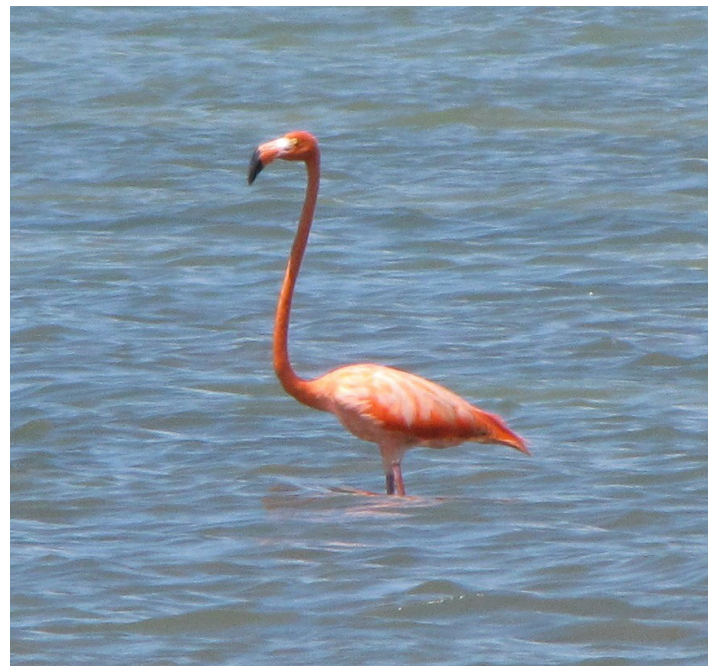


Fig. 8. Adult American Flamingo at Mannings Bay on 13 October 2010. Photograph by L.D. Yntema.

to 1981 documented from 19 to 91 active nests each year with a mean of 46 (VIDFW unpubl. reports). During those years, annual censuses were conducted from 30 March to 9 July, while a second census in 1979 was conducted on 27 December. As the Buck Island breeding colony is currently the only one on St. Croix and its offshore islands, precise population and nest counts are highly desirable.

***Ixobrychus exilis* (Least Bittern).**—A single volant juvenile was perched just above water in a small white mangrove in Mannings Bay East Pond on 17 October 2006 (CCB, LDY). On 17 February 2012, a pair of Least Bitterns in alternate plumage was seen in and flying from a red mangrove on the northwestern side of this same pond (LDY, CCB). However, we did not obtain any evidence of breeding. Least Bitterns had been considered extirpated from the USVI for over 60 yr (Nichols 1943).

Least Bitterns were first reported on St. Croix when Beatty (1943) flushed a pair from the mangroves of the former Krause Lagoon on 5 May 1939. He reported a pair on 16 August 1940 at this same site, and discovered a female with two eggs there on 21 July 1942. Seaman (1980) describes finding a nest with three eggs and later discovering a “small colony” in Krause Lagoon, but no dates are given.

***Ardea alba* (Great Egret).**—Great Egret nests in the interior of St. Croix have only been documented at one freshwater location, Castle Burk Pond, where the first nest was located in March 2004 (McNair *et al.* 2005). Breeding was again confirmed there on 26 January 2005 when three active Great Egret nests were observed in a saman tree (*Pithecellobium saman*). Nesting continued at least through 7 March (LDY, DBM).

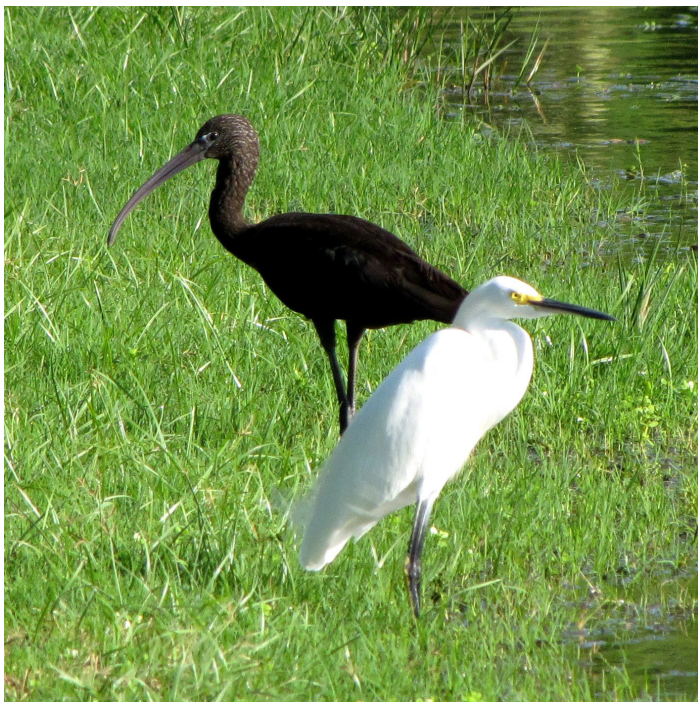
A Great Egret with orange wing tags was observed at Isaac’s Bay, St. Croix, on 17 December 2010 (R. Gideon pers. comm.). A tag code was present but too far away to read. At nearby Point Udall, a Great Egret with coded, orange wing tags was photo-

graphed on 10 February 2011 (R. Prol pers. comm.) and identified as a bird that was tagged as a nestling on 12 July 2010 on Nottawasaga Island, Lake Huron, Ontario, Canada (C. Weseloh pers. comm.; USGS-BBL). It is likely that these two sightings were both of the same bird.

***Butorides virescens* (Green Heron).**—From 2004 to 2012, we confirmed Green Herons nesting at 24 wetland sites, 18 freshwater and 6 saline (LDY, CCB, DBM, SLF). During most of those years, Green Herons nested at up to five different wetland sites. However, we confirmed breeding at 10 ponds (9 freshwater and 1 saline, Southgate Pond) from April through August in 2011 (LDY, CCB), when rainfall was above average for the second consecutive year (Fig. 1). The greatest number of nests documented at any one location was at Southgate Pond in 2011 (CCB, LDY). Twelve nests were discovered at Southgate, 11 in white mangroves and 1 in a black mangrove at the pond edge. All nests in this loose colony were in mangroves surrounded by water at the time of nest initiation. Southgate Pond and other normally ephemeral ponds did not dry out during 2010 or 2011, thereby increasing the availability of favorable nest sites in manglars surrounded by water (Dickerman and Gavino 1969, Davis and Kushlan 1994) and plentiful food from a wide array of wetland foraging sites.

Green Herons breed every year at Great Pond where abundant red mangroves provide ample nesting habitat for them (LDY, DBM, CDL, JMV). However, systematic nest searches have not been conducted due to dense habitat and concerns about disturbing White-crowned Pigeon nests.

***Plegadis falcinellus* (Glossy Ibis).**—A specimen collected on 20 February 1861 (UMZC 11/Thr/16/a/8) by “F.R.N.” (full name uncertain) confirmed the first record of a Glossy Ibis on St. Croix.



**Fig. 9.** Glossy Ibis with Snowy Egret (*Egretta thula*) at Buccaneer Hotel Golf Course on 18 October 2010. Photograph by L.D. Yntema.

A flock of six at William Pond on 15 September 1958, with three remaining from 2 to 10 October, was the second documented occurrence (Seaman 1959). The third and fourth occurrences were single birds at UVI Wetlands Reserve on 3 October 1981 (FWS unpubl. data) and at a Buccaneer Hotel Golf Course pond on 13 January 1985 (FWS unpubl. data; Norton 1985b). From 2005 to 2010, after a span of 20 yr, four individual Glossy Ibis were verified on St. Croix. The first was feeding in a small ephemeral pool at Rust-op-Twist on 15–16 October 2005 (SLF, CCB, LDY; Appendix 2.13) during a period of abnormal winds from the west and south (Lewis 2007, Faaborg and Gauthreaux 2014); likely the same bird was at the V.I. Department of Agriculture (VIDA) Lower Pond overflow on 20 October 2005 (LDY). Another individual was at the Lowry Hill Road North Pond (CCB; Appendix 2.14) and nearby Buccaneer Hotel Golf Course putt hole 4 pond from 31 January through 26 March 2009 (CCB, LDY, SLF); likely the same bird was observed at Great Pond on 19–23 May 2009 (LDY). Another bird was at Castle Burk Pond on 3 September (LDY; Appendix 2.15) and 8 October 2009 (LDY, SLF). Finally, a single ibis was photographed on a flooded section of the Buccaneer Hotel Golf Course on 18 October 2010 (LDY; Fig. 9).

***Pandion haliaetus* (Osprey).**—Ospreys are regular winter visitors to St. Croix from autumn through spring. Notable, however, were as many as 24 Ospreys seen at wetlands across the island in mid-October 2010 in the wake of Hurricane Otto. Eight and nine birds roosting and fishing at Carambola Golf Course lower ponds on 12 and 13 October 2010 (SLF, LDY) provided single site high counts. At least one immature bird has been observed during June and July in five of the years from 2006 through 2012 (LDY, CCB), reaffirming that some immature Ospreys may remain on St. Croix through the summer (McNair et al. 2005).

Two Ospreys banded as chicks in the USA were recovered on St. Croix (USGS-BBL). One banded at Barnegat Light, New Jersey, on 30 June 2006 was found dead in Christiansted on 3 October 2008 (USGS-BBL). The other individual, banded at Point Lookout, Long Island, New York, on 9 July 2009, was found that same autumn on 26 October with wing injuries consistent with burns from contact with high voltage power wires. It did not survive its injuries (AOL).

***Circus hudsonius* (Northern Harrier).**—The first record of Northern Harriers on St. Croix was of 15 birds seen by Beatty (1941) on 2 November 1940, with several individuals remaining until 16 April 1941. Beatty collected two female specimens, one on 9 November 1940 (FMNH 156970) and the other on 15 January 1941 (FMNH 156969). More recent occurrences of Northern Harriers on St. Croix are limited to four observations of single birds, two in the autumn and two in the spring. The first was on 23 October 1984 (locality data lost, FWS unpubl. data; Norton 1985a). The other three were individuals flying low over Great Pond on 31 October 2007 (LDY), 3 March 2009 (LDY, CCB), and 24 March 2009 (LDY). It is not known if the latter two birds were different individuals.

***Porphyrio martinicus* (Purple Gallinule).**—Purple Gallinule bones found in 1934 in an ancient kitchen midden (Wetmore 1937) provided the first record of this species for St. Croix. There were only two other occurrences before 2004, two adults at UVI Wetlands Reserve on 29 January 1984 (Sladen 1988) and one individual at Fredensborg Pond from 10 to 12 September 1986



**Table 3.** Occurrence of the Purple Gallinule on St. Croix from August 2004 through July 2012.

Site Name	Year	Dates Present	Number	Age
Granard South Pond	2004	25 November	1	juv
Fredensborg Pond	2005	8 March	2	1 ad, 1 imm
Granard South Pond	2005	29 March	1	imm
Prosperity Pond	2007	20 January–12 March	1	imm
Buccaneer Waste Water Treatment Pond	2007	22–23 March	1	ad
Longford West Pond	2007	20 June	1	ad
VIDA Upper Pond	2007	16 August	1	ad
Castle Burk Pond	2009	7 April	1	ad
Schuster Lower Pond	2010	25 January	1	imm
VIDA Upper Pond	2010	12 October	1	imm
Prosperity Pond	2011	8–31 March	1	imm

(R. Wauer and FWS unpubl. data). Since 2004, adult, immature, and juvenile Purple Gallinules have occurred on St. Croix during six different years, in eight different months, and at eight freshwater ponds (LDY, CCB, DBM, SLF; Table 3, Appendix 2.16–2.19).

***Gallinula galeata* (Common Gallinule).**—Common Gallinules, very common in freshwater ponds across the island, were confirmed breeding at four saline sites from April 2002 through December 2004 (McNair *et al.* 2006a). From January 2005 through July 2012, breeding was documented at an additional six saline sites (LDY, CCB, SLF), listed here in alphabetical order: Buccaneer Hotel Golf Course putt hole 4 pond (2006, 2007, and 2009), Coakley Bay Salt Pond (2009–2011), Great Pond (2011), Green Cay Salt Pond (2011), Krause Lagoon Remnant (2010), and UVI Wetlands Reserve (2007–2008).

***Fulica americana* (American Coot).**—The breeding ecology of American and Caribbean Coots (hereafter treated as one species, American Coot [Chesser *et al.* 2016]) at Southgate Pond and the status of coots on St. Croix are documented in McNair (2005), McNair and Cramer-Burke (2006), and McNair *et al.* (2005, 2006a). McNair and Cramer-Burke (2006) documented that breeding may begin as soon as 2–3 weeks after a heavy rainfall event and may be prolonged depending on sustained high water levels and availability of suitable nesting substrate. In order to capture the full extent of the rainy season and concurrent coot breeding, the coot “breeding period” as used herein runs from June through May of the following year.

Coots continued to nest at their main breeding site, Southgate Pond, every year from 2005 to 2012 when environmental conditions were suitable, primarily from autumn to spring. We documented a total of 116 coot nests at Southgate Pond from June 2005 to July 2012 (CCB, LDY, U. Toller, and DBM). As before (McNair and Cramer-Burke 2006), most nests were built on the branches or in the root crotches of live white mangroves. A few, however, were built on dead mangrove wood, in live black mangroves, and in wetland grass. We documented 13–22 nests during each of the four breeding periods from June 2005 to May 2009 (CCB, LDY, U. Toller, and DBM). Clutch initiation during several of these breeding periods began as early as June and unfledged juveniles were observed as late as May. Only two nests were documented during the 2009–2010 breeding period,

one each in December and January (CCB, LDY). Differences in water levels and salinities do not appear to have been the limiting factor, so the reasons for low breeding effort in that period are obscure. During the next 3 yr, coots at Southgate Pond bred without interruption over an unusually long stretch of 25 months (CCB, LDY). The first clutches were initiated in July 2010 and active nests or unfledged juveniles were continuously present through July 2012. Forty-three nests were documented during this 25-month period. Consistently high water levels and low salinity, coupled with the availability of appropriate nesting habitat in live white mangroves, allowed this extended breeding event to occur.

Before 2005, the maximum number of coots at Southgate Pond, or any other site on St. Croix, was 69 birds observed in July 2004 (McNair 2005). Since then many higher counts have been recorded at Southgate Pond, with the maximum count of 213 adult and immature coots on 21 July 2012 (CCB).

From 2002 to 2005, McNair (2005) documented coots breeding at only one saline site on St. Croix: Southgate Pond. In 2010 and 2011, nesting was confirmed at three additional saline sites (LDY, CCB): Coakley Bay Salt Pond, Mannings Bay East Pond, and Mount Fancy Salt Pond. Four of the five nests observed at both Mount Fancy Salt Pond and at Coakley Bay Salt Pond were built in small, solitary black mangroves. Three of the four nests at Mannings Bay East Pond were in small red mangroves. As at Southgate Pond, high water levels, low salinity, and the woody substrate of in-pond mangroves provided good nesting conditions at these other three saline sites during the same prolonged period of high rainfall in 2010–2011 (Fig. 1).

Coot breeding was confirmed (nests with eggs or flightless young) at six freshwater ponds on St. Croix before April 2005 (McNair 2005). Since April 2005, coots continued to breed on at least three of those ponds: Carlton North Pond, Fredensborg Pond, and Granard South Pond (LDY, CCB). We found no evidence of breeding at VIDA Middle Pond and access was curtailed at the other two ponds. Coot breeding was documented at nine additional freshwater ponds from May 2005 to July 2012 (LDY, CCB, SLF, DBM), listed here in alphabetical order: Carambola Golf Course North Marsh (2011), Carambola Golf Course Upper Pond (2009 and 2011), Frangipani East Pond in Libanon Hill



(2009 and 2011), Longford West Pond (2007–2009), Lowry Hill Road North Pond (2011), Lowry Hill Road South Slough (2011), Mount Fancy Pond (2011), Schuster Lower Pond (July 2005), and Windsor North Pond (2011). In these freshwater ponds, coots built their nests on a variety of substrates: dead and live *Sesbania sericea*, lily pads, wetland grasses, creeping burrhead (*Echinodorus berteroi*), and a fallen dead branch. Even though a large saline site (Southgate Pond) remains the favored coot breeding location, our confirmation of breeding at a total of 15 small freshwater ponds on St. Croix reinforces the importance of this other site type to coots (also see Prins et al. 2005, Nijman 2010). The freshwater sites are a mixture of older farm ponds, golf course ponds, and functional ponds such as small reservoirs and sewage treatment ponds. Breeding was largely overlooked on St. Croix at saline and freshwater sites until the 21st century because of inadequate search effort (McNair 2005).

***Himantopus mexicanus* (Black-necked Stilt).**—On St. Croix, Black-necked Stilts usually breed at saline wetland sites. Nesting at freshwater sites in the interior has been rare, with documented nests at three sites before 2004 (McNair et al. 2005). Subsequently, breeding at freshwater ponds has been documented at four more sites (LDY, CCB). At Fredensborg Pond, an adult pair was observed with two young one-fifth grown on 29 June 2006 and four adults were with two downy young on 10 July 2008. At Sight North Pond, an adult pair exhibited “wing-flagging” distraction displays typical of adults with young (Hamilton 1975) on 2 June 2008 and an adult was with four dependent young on 4 June 2009. At Longford Southeast Pond, an adult pair accompanied a downy young on 18 June 2009. Finally, at Cruzan Rum Distillery Pond, an adult pair accompanied a juvenile three-fifths grown on 25 July 2012. Nesting along the coast is even rarer on St. Croix. Unusual then were two active nests with four eggs each, discovered on 20 June 2005 at Judiths Fancy (LDY) on the coral cobble spit near the sea’s edge, where their usual wetland habitat is not available.

***Haematopus palliatus* (American Oystercatcher).**—Previous St. Croix breeding records are summarized by McNair et al. (2005) and were overlooked by Kushlan et al. (2011). American Oystercatchers continued to nest sparsely along the coral rubble shorelines of Green Cay and Ruth Island, two of St. Croix’s near-shore cays. On Ruth Island, two pairs, with one adult brooding, were present on 23 June 2008 (JMV). Single pairs were also present on this date at two other sites: a pair at Isaac’s Bay on the East End of St. Croix that did not appear to be associated with a nest (CDL), and a pair at an empty nest on the coral cobble spit at Judiths Fancy (LDY, CDL). On 22 May 2009 (AOL), an active nest was found on the cobble beach at Hams Bluff, the third documented nesting site on St. Croix proper. Adults were still on territory near the nest site on 25 June (LDY). We did not determine the outcome of any of these breeding efforts.

***Pluvialis dominica* (American Golden-Plover).**—Small numbers of American Golden-Plovers are regular but uncommon on St. Croix during autumn migration, from mid-September through early November (Seaman unpubl. report [1957]; this study). Seaman (1973) described small flocks arriving on St. Croix in the mid-1930s, including 18 birds at Whim on 16 September 1935 and 14 at Lower Love on 16 September 1936. Larger numbers of American Golden-Plovers have occurred on St.

Croix, usually in association with storms (Newton and Newton 1859c). On 27 September 1984, 183 American Golden-Plovers were observed at multiple sites around the island, with a single flock high count of 85 in a field near HOVENSA (FWS unpubl. data; Norton 1985a). On 4 October, 140 birds were still present, including 80 at the refinery. Although no named storms passed close to St. Croix in late September 1984, that autumn’s active Atlantic storm season (12 named storms and hurricanes) likely contributed to the unusual number of American Golden-Plovers observed on St. Croix during this period (Norton 1985a). On 9 October 2010 following the passage of Hurricane Otto, 39 American Golden-Plovers were present in a flooded experimental rice field in La Grange (LDY, CCB). Five days later, a notably large flock of approximately 190 was repeatedly flushed by a Merlin (*Falco columbarius*) at Renaissance Mangrove Remnant Wetland. Late season occurrences of American Golden-Plover in the USVI are summarized in McNair et al. (2005).

***Charadrius nivosus* (Snowy Plover).**—The first record on St. Croix is of one bird that was observed foraging along the edge of West End Salt Pond on 14 August 2009 (CCB, LDY, CDL, JMV; Appendix 2.20). Most prior published reports, except for one observation in 2002, lack detail (see McNair et al. 2005). The historic report of Snowy Plover eggs on St. Croix (Beatty 1930, Seaman 1993) appears to have incorrectly identified the eggs of a Wilson’s Plover (*C. wilsonia*; Gorman and Haig 2002, McNair et al. 2005). It is possible that Snowy Plovers once nested at Krause Lagoon, but breeding and resident status of this species in the USVI has not been verified (*contra* Elliot-Smith et al. 2004, Brown 2012).

***C. wilsonia* (Wilson’s Plover).**—Wilson’s Plovers have occurred at 35 localities on St. Croix, with breeding confirmed at 29 of these wetland and coastal sites (DBM, LDY, CCB, CDL). Detailed unpublished surveys conducted in 2002–2003 and 2010 indicate that 35–45 pairs breed on St. Croix, primarily on dry saline mudflats and to a lesser extent on sandy or cobble beaches. Great Pond remains the primary breeding site for this species in spite of the deleterious effects of vehicular traffic across its mudflats and flooding from heavy rainfall. Additionally, if rain falls prior to or during nest development, the high moisture retention capacity of the fine, silty, and clayey wetland soil (USDA 1970) can make the mudflat substrate unsuitable for the dry nest requirements of Wilson’s Plovers.

Great Pond has also been the favored non-breeding site for this species, at least during some years (McNair et al. 2005). In the autumn and winter seasons from 2007 to 2010, however, large groups of Wilson’s Plovers occurred about 4.5 km west along the south shore at Halfpenny Bay beach, with a high count of 51 birds there on 29 December 2009 (LDY, CCB). This beach served as a diurnal roost site where the flocks were well camouflaged by dry seaweed or by grass on the upper beach (LDY; Appendix 2.22). A group of 25–33 birds also used similar habitat at nearby Canegarden Bay beach as a temporary diurnal roost site from 9 to 13 December 2010, after Halfpenny Bay beach was severely eroded by high surf (CDL, LDY). In mid-December 2010, 18–24 Wilson’s Plovers returned to Great Pond where they were observed for the remainder of the winter, hiding among dried mud divots (LDY; Appendix 2.23), mangrove pneumatophores, and *Sesuvium* spp. (LDY, CCB). Typically, the Great Pond



Fig. 10. Adult Piping Plover in alternate plumage at Long Point Bay beach on 8 April 2008. Photograph by L.D. Yntema.



Fig. 11. Piping Plover in basic plumage at Long Point Bay beach on 3 December 2008. Photograph by L.D. Yntema.

mudflats are flooded by substantial rainfall and run-off in the autumn, restricting Wilson's Plover roosting and feeding opportunities. These wet conditions likely contributed to their move to the well-drained, sandy beach habitat during rainy seasons.

Non-breeding season movements of Wilson's Plovers from saline mudflats to Halfpenny Bay and Canegarden Bay beaches also coincided with the autumn return of migrant Peregrine Falcons (*Falco peregrinus*) and Merlins. Both of these raptors hunt shorebirds in the open habitat at Great Pond and other wetlands in the autumn and winter. Thibault and McNeil (1994, 1995) found that resident Wilson's Plovers in northeastern Venezuela changed their diurnal feeding behavior and foraged almost exclusively at night during the non-breeding season. Wilson's Plover's primary prey (fiddler crab [*Uca* spp.]) is more active and available during the day, yet Thibault and McNeil (1994, 1995) concluded that the change to nocturnal foraging is a strategy to avoid predation by diurnal raptors. Further study is needed on St. Croix to understand year-round movements and behaviors of Wilson's Plovers, including their nocturnal foraging activities.

**C. melodus (Piping Plover).**—The Piping Plover occurs infrequently on St. Croix, with three reports from the 1980s and four occurrences since 2007, all of single birds. The first documented report was of one at Canegarden Bay beach on 16 September 1982 (Sladen 1988). FWS (unpubl. data) subsequently observed individual birds at the same site on 30 August 1983 and on Buck Island on 2 October 1983. The four reports since 2007 include three records: an adult in basic plumage changing into alternate plumage at Long Point Bay beach from 10 October 2007 to 8 April 2008 (LDY; Fig. 10), an individual in basic plumage again at Long Point Bay beach from 11 September to 3 December 2008 (LDY, CCB, SLF; Fig. 11), one at Chenay Bay beach on 17 September 2008 (CCB; Appendix 2.21), and a single individual on the beach at Sandy Point National Wildlife Refuge (Sandy Point NWR) on 19 October 2010 (CDL). The Piping Plover occurs rarely but regularly in adjacent Puerto Rico (Lewis et al. 2006), but no

records exist from the northern USVI.

**Tringa semipalmata (Willet).**—Breeding and winter occurrences on St. Croix through July 2004 are summarized in McNair et al. (2005). Willets have continued to breed at two previously confirmed sites: at Krause Lagoon Remnant, where nesting was observed in 1985 (FWS unpubl. data), an adult incubating eggs on 26 June 2005 was one of four birds present; and on Ruth Island, where one to two Willet nests have been recorded in May and June of some years since at least 1983 (Norton 1983b, McNair et al. 2005), a nest with two chicks and two eggs was observed on 30 May 2008 (JMV). At a new, nearby breeding site, Renaissance Lower Cooling Pond, one downy chick was accompanied by both parents on 6 June 2006 (LDY). Lastly, at the adjacent Renaissance Mangrove Remnant Wetland, a territorial adult was present on 16 July 2007 and 18 July 2012 (LDY), but no nest or juveniles were found on either date at this largely inaccessible site.

Willetts have been observed on St. Croix during every month of the year since 2005, most frequently from July to September. The highest counts during this period were a flock of eight observed in flight off the southwest beach at Sandy Point NWR on 15 July 2005 (CDL, LDY), one volant juvenile with five other Willetts at Renaissance Mangrove Remnant Wetland on 26 July 2010 (LDY), and six birds feeding with Whimbrels (*Numenius phaeopus*) at Southgate Pond on 6 September 2008 (LDY). As observed by FWS in the 1980s, Willet numbers on St. Croix are lowest during the non-breeding season (McNair et al. 2005). Since the winter of 2004–2005, no more than two birds have been present at any one site from November through March, with most occurrences at Great Pond (six of seven winters), and fewer at the Mannings Bay East Pond (three winters) and Mount Fancy Salt Pond (one winter).

**Bartramia longicauda (Upland Sandpiper).**—Upland Sandpipers are rare autumn migrants from August to October on St. Croix. The first record was a flock of undocumented size on



28 August 1936 in Lower Love (Beatty 1938), where a male was collected on 29 August (USNM 353959). Although Seaman (1993) observed Upland Sandpipers before 1954, his only explicit record is of seven birds at Enfield Green on 8 September 1954, when he collected two males (ANSP 169938 and 169939). In 1984, three juveniles were observed in a field at Southgate Farm on 19 September, with one remaining through 2 October (FWS and E. Roebuck unpubl. data). Twenty years later, single individuals or small flocks of Upland Sandpipers were observed in seven of eight consecutive years (2004 to 2011): one bird at Renaissance Park on 19 October 2004 (DBM, CCB, LDY); one bird at VIDA on 20 October 2005 (LDY) following a period of unsettled weather in the Caribbean with unusual winds from the west (Faaborg and Gauthreaux 2014); one bird at Two Brothers on 1 August 2006 (LDY); three birds at Canegarden during the first half of September 2008 (AOL; Fig. 12); five birds at Longford on 17–18 September 2009 (LDY); one bird at Great Pond on 11 October 2010 (LDY; Appendix 2.24); and four birds in a field at the Henry E. Rohlsen Airport on 26 September 2011 (J. Hairston pers. comm.).

***Numenius phaeopus* (Whimbrel).**—The highest Whimbrel counts on St. Croix have generally been during autumn migration, from mid-August to mid-October. In the 1980s, 42 Whimbrels were observed across three sites on 27 September 1984 (FWS unpubl. data; Norton 1985a). The largest flock was 26 birds at Coakley Bay Salt Pond (FWS unpubl. data). Seventeen were still present on 17 October 1984, a late date for a group of that size. The highest winter count for that decade was 20 birds at Great Pond on 3 February 1985 (FWS unpubl. data; Norton 1985b). From 2002 to 2012, high counts during autumn migration included 20 birds at Southgate Pond on 25 August 2008 (LDY, SLF), 17 at Coakley Bay Salt Pond on 25 August 2009, and 15 at Great Pond on 13 September 2011. The highest winter counts were 12 birds at Great Pond and 12 at Coakley Bay Salt Pond on 13 and 14 January 2009, respectively (LDY, SLF). Great Pond's shallow wetland areas, protective mangrove habitat, and plentiful food in the form of fiddler crabs continue to make it the most favorable stopover and winter habitat for Whimbrels on St. Croix (see below). One to four birds, most likely immature individuals (following Skeel and Mallory 1996), have summered at Great Pond each year since 2005.

Multi-year winter site fidelity for one remarkable Whimbrel has been verified on St. Croix. An adult female called "Hope" (Appendix 2.25) was captured on the Eastern Shore of Virginia in May 2009 (Watts et al. 2008, Weidensaul 2012). She was banded and fitted with a satellite transmitter and tracked year-round between her breeding grounds in the Northwest Territories, Canada, and her wintering grounds at Great Pond, St. Croix (Watts et al. 2008, Weidensaul 2012), with two "refueling" stops en route (B. Watts and F. Smith pers. comm.). She repeated this circuit using the same sites each year and, depending on storm encounters, arrived on St. Croix between 14 August and 14 September each autumn. Each spring from 2010 to 2012 she departed St. Croix during the first 10 days of April (B. Watts and F. Smith pers. comm.). Hope and other tracked Whimbrels have shown strong fidelity to their breeding, staging, and wintering sites, emphasizing the importance of each finite area to their yearly cycles and to their survival (F. Smith and B. Watts unpubl. data).

***Limosa haemastica* (Hudsonian Godwit).**—Hudsonian Godwits are rare autumn migrants on St. Croix from mid-September through early November. The three earliest occurrences, all in the 1980s, were at sheep pastures in Prosperity: 15 birds on 9 October 1985, which remained in smaller numbers until the following week (FWS unpubl. data; Norton 1986); one bird on 17 September 1988 (FWS unpubl. data); and eight birds from 2 to 5 October 1988 (Norton 1989). Since 2005, Hudsonian Godwits occurred five more times during autumn migration. From 13 to 26 October 2005, following an unusual period of prolonged westerly winds (Faaborg and Gauthreaux 2014), one to five birds were at the VIDA Lower Pond overflow (LDY, SLF; Appendix 2.26). One bird was at Halfpenny Mangrove Wetland on 23 October 2006 (LDY) and another individual was at UVI Wetlands Reserve on 2 November 2008 (CCB). Following Hurricane Otto in October 2010, at least 60 Hudsonian Godwits were found in shallow, often temporary wetlands across St. Croix (LDY, CCB, SLF). This included a flock of 45 at a temporary wetland in La Grange on 8 October, where 32 were still present on 10 October (LDY, CCB), and 46 birds at the VIDA Lower Pond overflow on 12 October (SLF; Appendix 2.27), where 4 remained on 26 October (LDY, SLF). In 2011, two birds were at Mount Fancy Salt Pond on 28 October (LDY, CCB; Appendix 2.28).

***Arenaria interpres* (Ruddy Turnstone).**—Prior occurrences and re-sightings of marked Ruddy Turnstones are summarized in McNair et al. (2005). Twenty-eight observations of at least eight marked turnstones, including five birds carrying individually coded flags, were documented on St. Croix from September 2005 through July 2012 (Table 4, Appendix 2.29 and 2.30). These individuals were originally captured, banded, and marked during spring migration in coastal Delaware or New Jersey from May 2001 to 2011 (Bandedbirds.org, USGS-BBL). Repeat observations of individually marked birds confirm site fidelity by individuals within a single season and for up to three non-breeding seasons (Table 4).



Fig. 12. Juvenile Upland Sandpiper at Canegarden in September 2008. Photograph by A.O. Lance.



**Table 4.** Re-sightings of Ruddy Turnstones marked with individually coded flags on St. Croix from August 2004 through July 2012.

Flag Code	Year Marked <sup>a</sup>	Re-sightings			
		Year	Date	Location	Observer
FL-TP7	2008	2008	6 October	Frederiksted pier/shore	G. Powell
		2009	22 January	Frederiksted pier/shore	USGS-BBL
		2010	29 August	Frederiksted pier/shore	LDY
		2011	23 August <sup>b</sup>	Frederiksted pier/shore	LDY
		2012	15 April	Frederiksted pier/shore	LDY
FL-COH	2008	2010	20 October <sup>c</sup>	Christiansted boardwalk	SLF
		2010	13 December	Christiansted boardwalk	G. McCreary
		2011	8 February	Christiansted boardwalk	USGS-BBL
FL-AM5	2008	2010	27 April	Southgate Pond	LDY, CCB, SLF
		2011	10 March	Mount Fancy Salt Pond	LDY
FL-MTA	2009	2009	29 September	Mount Fancy Salt Pond	LDY, SLF
		2010	23 January	Mount Fancy Salt Pond	LDY
		2011	10 March	Mount Fancy Salt Pond	LDY
FL-T2M	2011	2011	21 October	Frederiksted pier/shore	LDY
		2012	28 January	Frederiksted pier/shore	LDY
		2012	25 May	Frederiksted pier/shore	LDY

<sup>a</sup>Bandedbirds.org, USGS-BBL<sup>b</sup>Appendix 2.29<sup>c</sup>Appendix 2.30

***Calidris canutus* (Red Knot).**—A Red Knot captured and uniquely marked (FL-HUN) in Delaware in May 2006 (NJDFW, USGS-BBL), was re-sighted with two other knots at Southgate Pond on 5–6 September 2008 (CCB, LDY; Appendix 2.31). Rare in spring and summer on St. Croix (McNair et al. 2005), single Red Knots were at Southgate Pond on 17 and 28 June 2006 (LDY, CCB), at the Renaissance Mangrove Remnant Wetland on 22 April 2008 (LDY, SLF), and at West End Salt Pond on 8 April 2011 (CCB, LDY).



**Fig. 13.** Juvenile Ruff at the Paul E. Joseph Stadium field, Frederiksted, on 14 October 2011. Photograph by L.D. Yntema.

***C. pugnax* (Ruff).**—A juvenile Ruff, loosely associated with several Pectoral Sandpipers (*C. melanotos*), fed in wet soil at the Paul E. Joseph Stadium field in Frederiksted on 14 October 2011 (LDY; Fig. 13). This is the third occurrence (see McNair et al. 2005) and first record for St. Croix. A female identified on St. Thomas on 21 August 1980 (Norton 1981b) provided the first documented report for the USVI.

***C. ferruginea* (Curlew Sandpiper).**—One molting adult in partial alternate plumage, foraging along the edge of Buccaneer Hotel Golf Course hole 8 pond on 27 September 2007 (LDY, CCB, SLF; Fig. 14), provided the first record and occurrence for the USVI. Other occurrences of this species in the West Indies are summarized in Levesque and Saint-Auret (2007).

***C. alba* (Sanderling).**—A Sanderling, captured and uniquely marked (FL-PTH) in New Jersey in May 2006 (NJDFW, USGS-BBL), was photographed at Mannings Bay West beach on 8 April 2008 (LDY, SLF; Appendix 2.32). A second marked bird (FL-1VX), captured in New Jersey in June 2010 (Bandedbirds.org, USGS-BBL), was photographed at Great Pond Bay on 13 September 2010 (LDY; Appendix 2.33). Sanderlings, uncommon but regular migrants on St. Croix, are observed primarily during migration and less frequently during the winter.

***C. subruficollis* (Buff-breasted Sandpiper).**—Buff-breasted Sandpipers have occurred on St. Croix three times, all during autumn migration. In the 1980s, an adult was seen in a sheep pasture at Prosperity from 28 September through 5 October 1982 and a juvenile was present at Southgate from 18 to 29 September 1984 (Sladen 1988). In 2007, a juvenile was observed along the grassy edge of Fredensborg Pond on 25 September 2007 (LDY, SLF).

***C. melanotos* (Pectoral Sandpiper).**—Pectoral Sandpiper is a regular though not generally abundant autumn migrant on St.



**Fig. 14.** Adult Curlew Sandpiper in partial alternate plumage at the Buccaneer Hotel Golf Course on 27 September 2007. Photograph by L.D. Yntema.

Croix, where the two largest counts have been associated with tropical storms or hurricanes during October. There were 217 birds in the pastures at Prosperity on 7 October 1985 after Tropical Storm Isabel (FWS unpubl. data; Norton 1986) and 101 birds at a temporary wetland at nearby La Grange on 9 October 2010 after Hurricane Otto (LDY, CCB).

***C. pusilla* (Semipalmated Sandpiper).**—Although the species is common, especially during autumn migration, marked Semipalmated Sandpipers are seldom observed on St. Croix. However, a bird originally banded in New Jersey (year unknown) was re-sighted with a partially legible lime flag at Southgate Pond on 9 September 2010 (LDY, CCB). Another bird, originally marked (FY-MMJ) near Paramaribo, Suriname, by the Suriname Forest Service, Nature Conservation Division in January 2010 (Banded-birds.org), was photographed at Halfpenny Mangrove Wetland on 30 August 2011 (LDY, CCB; Appendix 2.34).

***Phalaropus tricolor* (Wilson's Phalarope).**—Rare on St. Croix during autumn migration, with reports from August to mid-October in five different years (Sladen 1988, McNair et al. 2005), single Wilson's Phalaropes photographed at Krause Lagoon Remnant on 21 and 30 September 2010 (LDY, SLF; Appendix 2.35) and at Great Pond on 13 and 15 September 2011 (LDY, CCB; Appendix 2.36) constitute the first records for St. Croix.

***Chroicocephalus ridibundus* (Black-headed Gull).**—Black-headed Gulls have occurred four times on St. Croix, all single first-cycle birds observed in late autumn. In the 1980s, individuals were at the West End Salt Pond on 27 October 1981, at Krause Lagoon Remnant on 29 November 1982, and again at the latter site on 27 November 1985 (Norton 1983a, Sladen 1988). In 2007, one fed on discarded fish offal near the Frederiksted fishermen's pier on 30 November (LDY).

***Larus delawarensis* (Ring-billed Gull).**—First documented on St. Croix in 1981, one or two first-cycle Ring-billed Gulls have been irregular winter visitors on St. Croix (Sladen 1988, McNair et al. 2005). Up to four first-cycle birds were repeatedly observed in the Frederiksted area (i.e., Frederiksted pier, West End Salt Pond, and Frederiksted Beach) from 4 December 2010 (F. Gerard pers. comm.) to 26 January 2011 (LDY, CDL, SLF; Appendix 2.37).

***L. argentatus* (Herring Gull).**—All reports of Herring Gulls on St. Croix have been of one to two first- or second-cycle birds, observed from mid-October to early April. The first record was one collected by Anton Teytaud on 16 October 1960 (USNM 599685; Bond 1966). In the 1980s, a first-cycle bird was observed at Great Pond on 19 October 1981 (FWS, J. Yntema, M. Yntema, and E. Roebuck unpubl. data). One first-cycle Herring Gull at the Christiansted Harbor from 2 January to 2 April 1984 was accompanied by a second on 11 and 17 January, while a second-cycle bird was observed at this location on 3 January 1984 (FWS unpubl. data; Norton 1984b). Following the passage of Tropical Storm Klaus, two first-cycle birds were at the Frederiksted pier on 12 and 27 November 1984 (FWS unpubl. data; Norton 1985a) and one was at Renaissance Park on 2 and 25 December 1984 (FWS and P. Sladen unpubl. data; Norton 1985b). A first- and a second-cycle bird were at the Frederiksted pier from 10 January to 15 February 1985, while just a second-cycle individual was there on 25 February, and then two first-cycle birds remained there from 1 March to 19 March 1985 (FWS unpubl. data). The only report since 1985 was one first-cycle bird observed along the Frederiksted waterfront from 4 January to 7 February 2005 (DBM). The lack of recent reports is consistent with a sharp decline of Herring Gulls from eastern North America (likely the source of our birds) during the past 35 yr (Nisbet et al. 2013).

***L. fuscus* (Lesser Black-backed Gull).**—The third through fifth occurrences of Lesser Black-backed Gulls on St. Croix (see McNair et al. 2005), all first-cycle birds, were one observed on 27 April 2006 at West End Salt Pond (CCB, LDY), another at Southgate Pond on 15 July 2006 (CCB and D. McKinney), and one photographed at Southgate Pond on 1 May 2012 (CCB; Appendix 2.38).

***L. marinus* (Great Black-backed Gull).**—The first three occurrences of Great Black-backed Gulls on St. Croix were single birds: a first-cycle individual at the Frederiksted fishermen's pier from



**Fig. 15.** First-cycle Great Black-backed Gull at the Frederiksted fishermen's pier on 8 January 2005. Photograph by L.D. Yntema.



6 to 10 January 2005 (DBM, LDY, CCB; Fig. 15), a second-cycle bird at Renaissance Upper Cooling Pond on 25 October 2005 (SLF, LDY), and an adult observed flying over the beach berm at Southgate on 13 November 2010 (J. Gaines and CCB).

***Anous stolidus* (Brown Noddy).**—A weakened adult Brown Noddy, with no visible injuries but unable to fly, was photographed on Buck Island beach on 2 June 2009 (JMV and M. Treglia; Fig. 16). McNair *et al.* (2005) summarized earlier occurrences including the only other report since 2002, also of an injured bird, but lack details for the 1980s reports. All the 1980s Brown Noddy observations were made at sea or from shore with a scope (FWS unpubl. data). In 1982, 1 Brown Noddy was seen 1.5 km west of Frederiksted on 31 August, 10 were 3.0 km north of Christiansted on 7 September, and 65 were about 1.0 km offshore at the Navy Underwater Tracking Range at Sprat Hall on 15 October. In 1983, two birds were seen from Sandy Point NWR beach on 22 June. In 1984, eight Brown Noddies were 1.5 km north of Buck Island on 23 September. In 1985, 80 were counted from a boat 4.0–8.0 km northeast of Christiansted on 9 June, and 1 was seen from Sandy Point beach on both 5 and 12 July.

***Onychoprion fuscatus* (Sooty Tern).**—A debilitated Sooty Tern, a species rarely observed on St. Croix, was found at Sandy Point NWR beach in October 2005. In spite of rehabilitation efforts the bird died (AOL). At the same beach on 23 May 2010, six adult Sooty Terns associated briefly with Least Terns before flying off (CDL). Earlier records summarized in McNair *et al.* (2005) do not include the two observations from 1985. On 9 June 1985, 330 Sooty Terns were observed 4.0–8.0 km northeast of Christiansted and 188 were observed from Sandy Point beach on 1 July (FWS unpubl. data).

***O. anaethetus* (Bridled Tern).**—A weakened hatch-year Bridled Tern was found at Sandy Point NWR beach on 26 August 2011. It was successfully rehabilitated at the St. Croix Avian Sanctuary and released on 2 September (AOL; Fig. 17). Earlier occurrences are summarized in McNair *et al.* (2005) but a number of pelagic observations in the 1980s (all FWS unpubl. data) are not noted therein. In 1981, two Bridled Terns were 5.0 km north of Christiansted on 7 September. In 1982, 12 were observed from a boat 3.0 km north of Hams Bluff on 22 May, 2 were 3.0 km west of Frederiksted on 30 August, 14 were 3.0–6.5 km west of Frederiksted on 31 August, and 5 were 3.0 km north of



Fig. 17. Hatch-year Bridled Tern about to take flight on 2 September 2011. Photograph by A.O. Lance.

Christiansted on 7 September. In 1983, one Bridled Tern was 5.0 km north of Christiansted on 5 September. In 1984, seven birds were observed 5.0 km north of Christiansted on 3 May, while five were 8.0 km north of Christiansted on 6 May. In 1985, eight Bridled Terns were 4.0–8.0 km northeast of Christiansted on 9 June.

***Sternula antillarum* (Least Tern).**—Least Terns migrate to St. Croix each spring to nest on sandy or cobble shorelines, dry mudflats and salt pond beds, offshore cays, altered industrial terrain, and within managed areas. A study conducted from 2003 through 2006 at the 20 nesting sites on St. Croix (Lombard *et al.* 2010) provided a single-season high count of 1,341 nest attempts (2004) and a low of 919 (2003). The HOVENSA oil refinery compound was the site with the highest number of Least Tern nests during all years except 2003. The single-season high of 473 nests was recorded at HOVENSA in 2006 and comprised the various nesting areas throughout that industrial compound. However, the largest single colony of 357 nests was on the dry bed of Southgate Pond in 2003. This colony was destroyed by free-roaming dogs. Although the nest numbers appeared encouraging, the number of chicks fledged per adult pair (0.15) was well below the 0.51–1.00 range necessary to maintain long-term stability of this population without considerable immigration (Lombard *et al.* 2010).

From 10 May to 16 August 2010, island-wide synchronized surveys of Least Terns and their nests were conducted at 2-week intervals (CDL unpubl. data). Seventeen sites were surveyed, but access to Renaissance Park was denied. The highest single-day counts were 288 nests and 725 adult birds, both on 25 May. As in 2004–2006, the site with the highest number of nests in 2010 was HOVENSA, with a single-day high count of 152 nests on 8 June (J. Wakefield unpubl. data). The second highest single-day, single-site count in 2010 was at Great Pond, where the colony on the dry bed of the southeast mudflats contained 66 nests on 21 June. Above average rainfall in late June and early July 2010 caused nest failure at all wetland mudflat sites. The year's sin-



Fig. 16. Adult Brown Noddy on Buck Island on 2 June 2009. Photograph by Michael Treglia.



gle-day high count of unfledged juveniles was 36, with 10 at Great Pond and 26 at HOVENSA, on 21 June 2010 (J. Wakefield unpubl. data). While nest numbers and the chick survival rate appear to have declined compared to the 2003–2006 study, individual nests were not marked or monitored in 2010, so neither the total number of nest attempts nor nest and chick survival rates could be determined for that year.

Least Tern nest success and chick survival on St. Croix continue to be severely limited by three adverse factors: 1) heavy rainfall and associated sheet runoff and flooding; 2) predation of eggs and chicks by invasive mammals, primarily free-roaming domestic dogs, feral cats, and mongoose (*Herpestes auro-punctatus*); and 3) human disturbance. Heavy rainfall can raise saline pond levels, effectively narrowing dry wetland mudflats and thereby diminishing available nesting area. Lombard et al. (2010) determined that nest success was significantly and negatively impacted by heavy rainfall and flooding which can cause eggs to be washed from their nests, or become mired (“egg-sticking”), chilled, and more susceptible to predation if adults leave the nests. Nest loss was evident on non-porous wetland mudflats during the unseasonably heavy rainfall that occurred in 2010 and 2011 (Fig. 1). Altering some wetland mudflat nesting sites to provide slightly elevated areas with more porous substrates and better drainage may improve nest success (Thompson et al. 1997, Burger and Gochfeld 1990, Mazzocchi and Forsy 2005). Nonetheless, the wetland mudflats nest sites, especially pond beds and edges without any vegetation, may serve as a population trap or sink for Least Tern populations on St. Croix during wet breeding seasons.

Free-roaming invasive mammalian predators present an island-wide problem. An enclosure constructed of wire mesh fencing and raised platforms in West End Salt Pond at Sandy Point NWR provided safety from mammalian predators, but young chicks fell prey to herons (species not confirmed). Chick shelters were installed but they did not deter avian predation.

Human disturbance included vehicular traffic along mudflats and dry salt ponds, beach activity, and removal of eggs from nests. Off-road vehicular traffic was partially curtailed by fencing and signage at three wetland nesting sites. Summer beach use by the public overlaps the peak of Least Tern nesting season. Sandy Point NWR’s wide sandy beach, a regular nesting site for both Least Terns and Leatherback Turtles (*Dermodochelys coriacea*), is closed to most beach-goers from April through August to protect the endangered turtles and their nests. Although the closure excluded most beach visitors, turtle and researcher activity still caused some disturbance and Least Tern nest loss. During the span of this study, eggs from two Least Tern nesting colonies (Coakley Bay Salt Pond and Ruth Island) were put in piles, probably by children, causing egg mortality (CDL, JMV, LDY). While management of nesting sites and public education are likely to continue, it is unclear if these efforts will be sufficient to raise nest and chick survival rates enough to sustain the Least Tern population nesting on St. Croix.

***Gelochelidon nilotica* (Gull-billed Tern).**—Gull-billed Terns remain rare on St. Croix (see McNair et al. 2005). In 2006, one adult in basic plumage was at Southgate Pond, Great Pond, and Renaissance Upper Cooling Pond from 7 to 28 September, while two were at Southgate Pond on 16 September (LDY, CCB, SLF,

and U. Toller). An adult in alternate plumage was observed at Great Pond on 9 and 21 August 2007 (LDY; Appendix 2.39) and a single bird was present there on 25 September 2008 (LDY, CCB, SLF).

***Chlidonias niger* (Black Tern).**—Black Terns have only been reported five times on St. Croix, all single birds during autumn migration from late August to early October. The first three reports were in the 1980s: an adult in basic plumage observed at Sandy Point NWR on 29 August 1984 (FWS; Norton 1985a), a juvenile at a HOVENSA lagoon on 3 September 1987 (FWS; Norton 1988a), and a molting adult at the Renaissance cooling ponds on 25 September (FWS and E. Roebuck unpubl. data) and 5 October 1988 (FWS and R. Wauer unpubl. data). More recently, an adult in basic plumage was at Southgate Pond on 31 August 2005 (CCB, LDY; Appendix 2.40) and an adult, probably the same individual, was at Granard South Pond on 14–15 September 2005 (LDY, SLF). A startled Peregrine Falcon dropped a freshly killed adult near the cliffs at Canegarden Bay on 20 September 2010 (AOL; Appendix 2.41).

***Sterna hirundo* (Common Tern).**—Common Terns are generally observed on St. Croix from mid-August to mid-November. Three juveniles and one bird of unknown age, all originally banded from mid-June to early July in coastal New York and Massachusetts, were recovered from late September to mid-October in four different years (1938, 1960, 1979, and 1989; USGS-BBL). Consistent with the autumnal timing of these recoveries, 16–48 birds loafing at and foraging just off the Frederiksted Beach from 30 September to 18 October 2006 constituted one of the highest counts for St. Croix (LDY; Appendix 2.42, partial flock). A Common Tern in second-year alternate plumage (rarely seen from land on St. Croix) was at Southgate Pond on 11 August 2004 (DBM, CCB, LDY). The spring occurrence of a second-year Common Tern on 24–26 March 2005, again at Southgate Pond, was unusual (CCB, LDY, DBM). Prior spring occurrences are summarized in McNair et al. (2005).

***Thalasseus maximus* (Royal Tern).**—Twelve Royal Terns, all originally banded as chicks from late June through July in coastal Virginia ( $n = 2$ ) or North Carolina ( $n = 10$ ) from 1976 to 2011, were recovered on St. Croix (USGS-BBL) from October to March and May to July, including six birds from 2002 through July 2012. Seven of these 12 birds died within 1 yr from hatching, whereas 2 were more than 20 yr old (20.5 and 22.5 yr) at the time of recovery. Ten of the 12 recovered birds were found alive and at least 2 individuals were treated at the St. Croix Avian Sanctuary (AOL). One of these, a debilitated individual in Frederiksted in October 2010, probably a casualty of Hurricane Otto, survived and was successfully released on 14 November 2010.

***Patagioenas leucocephala* (White-crowned Pigeon).**—Historical and recent breeding information on the White-crowned Pigeon on St. Croix was documented by McNair (2006, 2008b) and McNair and Lombard (2006). As in the recent past, Ruth Island and Great Pond continue to be the two primary breeding sites for this species. Nesting populations of White-crowned Pigeon at both sites have increased dramatically since 2002.

**Ruth Island.** In 2002 and 2003, 60 and 95 nests, respectively, were documented at Ruth Island (McNair 2008b). From 2006 to 2007, systematic trapping during a joint USFWS/MIDFW effort eradicated 92 black rats (*Rattus rattus*) but did not completely

eliminate rats from the island (CDL). During the three subsequent breeding seasons, crude estimates of White-crowned Pigeon nests (300 nests in August 2007, 500 nests in 2008, and over 500 nests in 2009 when all primary habitat and some secondary habitat appeared to be occupied) demonstrated a strong positive response of White-crowned Pigeons to rat removal and reduction of poaching (see below) at Ruth Island (JMV and W. Coles unpubl. data). Systematic nest counts should be regularly conducted at this site to obtain long-term data.

Poaching of squabs contributed to the complete failure of White-crowned Pigeon breeding efforts on Ruth Island in 2002 (McNair 2008b), although the influence of rat predation and disturbance is unknown. With the possible exception of the 2004 breeding season, poaching of squabs continued to be a problem through 2006 (W. Coles unpubl. data; McNair 2008b). However, evidence of significant poaching was not apparent during the 2007–2009 breeding seasons (JMV unpubl. data). The intermittent presence of VIDFW biologists on the cay during nesting seasons and VIDFW outreach to local fishermen who camp on beaches at Ruth Island may have accounted for the decline in poaching of squabs. During the non-breeding seasons of 2007, 2008, and 2010, White-crowned Pigeons were not observed roosting on or flying to or from Ruth Island (JMV unpubl. data).

**Great Pond.** McNair (2008b) estimated 55 breeding pairs at Great Pond in 2003. Numbers were higher on 14 May 2007, when at least 175 adults were present (LDY). Data collection was aborted on that date due to concern about disturbance of nesting White-crowned Pigeons. Nest stages of 10 nests ranged from fresh nests without eggs to nests with half-grown chicks. Less than 2 out of 30 ha (approximately 6%) of potential nesting habitat was sampled, leading to a crude extrapolated total of 150 nests at Great Pond in May 2007. This increase in breeding population was expected as favorable breeding habitat has expanded with the rapid growth and spread of red mangroves within the pond. As with Ruth Island, systematic nest counts should be conducted at Great Pond. Great Pond remained the preferred St. Croix roosting site for White-crowned Pigeons during the non-breeding season. Flight-line counts of birds flying northeast out of Great Pond at dawn (LDY, CCB, SLF) ranged from 175 (9 January 2007) to 460 (28 December 2010), a marked increase compared to 2002–2003 when 15–20 birds were recorded (McNair 2008b).

**Southgate Pond.** Scott and Carbonell (1986) stated that White-crowned Pigeons nested at Southgate Pond in the 1980s, although no nests were documented (McNair 2006). McNair *et al.* (2005) confirmed 15 breeding sites on St. Croix from 2002 to 2004 but did not observe nests or breeding activity at Southgate Pond despite extensive surveys at that site. Breeding was first confirmed at Southgate Pond on 27 December 2007 (CCB), outside of the primary breeding season, when one pair nested in a large white mangrove. Two downy young were observed in the nest on 4 January 2008 (CCB, LDY). Nesting was not confirmed again at Southgate Pond until 29 July 2010, when two adults were on nests in white mangroves (LDY). Additional confirmed breeding records in white mangroves at Southgate Pond included 11 active nests (8 hatched successfully) from 13 June to 15 August 2011 (CCB, LDY) and 8 active nests (including 1 in a black mangrove) from 29 February to 19 June 2012 (CCB). The

brooding adult on 29 February 2012 provided the second aseasonal breeding record at Southgate Pond. These nesting events at Southgate Pond are the first confirmed reports of White-crowned Pigeons nesting in an enclosed seasonal saline pond on St. Croix. Water levels were much higher than normal during years when nesting occurred at Southgate Pond. Mangroves containing nests were surrounded by water throughout these nesting periods, so the mangrove habitat was not dissimilar to that found at lagoons such as Great Pond.

**Additional Breeding Records.** Nesting outside the primary breeding season (April to September) continues to be an uncommon occurrence on St. Croix. Aside from the aseasonal Southgate Pond reports cited above, an adult was observed carrying nesting material at Great Pond on 18 November 2010 (LDY).

White-crowned Pigeons are obligate frugivores. The timing of breeding and the extent of their nesting efforts have been linked to the availability of appropriate fruits (Bancroft *et al.* 2000, Rivera-Milán 2001). Throughout the breeding season, adults regularly fly to and from nesting areas at Ruth Island and Great Pond on apparent foraging trips (LDY, JMV; J. Hairston unpubl. data). Studies to identify and prioritize significant foraging areas across St. Croix should be conducted to inform conservation of these habitats.

***Geotrygon mystacea* (Bridled Quail-Dove).**—Roadside and off-road counts of Bridled Quail-Doves during the 1980s showed a maximum roadside count of six birds along Creque Dam Road on 28 December 1985 and a maximum off-road count of nine birds at Caledonia Gut on 19 January 1987 (FWS and R. Wauer unpubl. data). In 1990, the year after Hurricane Hugo, no Bridled Quail-Doves were found along either of those northwestern guts or elsewhere on St. Croix (FWS unpubl. data; Wauer and Wunderle 1992). McNair *et al.* (2005) reviewed information that documented at least a partial population recovery after 1990. Regardless, Bridled Quail-Doves have been under-sampled on St. Croix because of insufficient effort from off-road surveys. Except for counts conducted from roads running along guts in the northwestern hills, the usefulness of roadside surveys for this species is limited because many Bridled Quail-Doves occur in the more remote, undeveloped parts of that area.

From 2005 to 2011, off-road surveys were conducted along four wooded northwestern guts: Annaly Bay, Annaly Cove, Caledonia, and Wills Bay (LDY, CCB, and G. Groner). These isolated stream bed gullies, with dense canopies of mature moist forest, relative lack of undergrowth, and tendency to retain small pools of water even during the dry season, provide good habitat for Bridled Quail-Doves (see Steadman *et al.* 2009). Maximum counts of nine birds occurred at Wills Bay Gut on 11 March 2006 and at Caledonia Gut on 3 January 2009 (CCB, LDY). Maximum counts of eight birds occurred at Annaly Bay Gut on 5 April 2006 and at Annaly Cove Gut on 4 January 2010 (LDY, CCB). Observations were of single adults or pairs with the exception of six birds drinking together at a puddle in Wills Bay Gut. One pair was observed arranging material in a nest 8 m above ground within a tangled vine on a slender branch near the waterfall at Caledonia Gut on 11 January 2010 (CCB, LDY). At a residence at Jolly Hill, 8 to 10 birds fed in the graveled driveway under large *Murraya paniculata* bushes on 19–25 March 2008 (LDY; Appendix 2.43), the same spot where two adults with two juveniles fed on 3 April





**Fig. 18.** White-winged Dove young in nest at Prosperity on 25 April 2007. Photograph by L.D. Yntema.

2003 (McNair *et al.* 2005). In each case, the birds consumed the hard seeds of *M. paniculata*. Bridled Quail-Doves are frequently seen singly or in pairs at Jolly Hill, an area that includes two streambeds edged with the mature moist forests preferred by this species. Although not directly comparable to prior counts, those conducted from 2005 to 2011 in the northwestern hills indicate that the Bridled Quail-Dove population on St. Croix has probably returned to pre-Hurricane Hugo numbers.

***Zenaida asiatica* (White-winged Dove).**—The White-winged Dove invaded the USVI in 1999 (McNair *et al.* 2005). Between February 2002 and July 2004, this species was seen at 23 sites on St. Croix, all but one on the drier East End (McNair *et al.* 2005). They are now regularly observed across the island. Nesting in the wetter, western end of St. Croix was first verified on 25 April 2007 at Prosperity, where one large chick was photographed in a nest 2.5 m above ground, in a fork of an *Acacia* sp. branch (LDY; Fig. 18). A second fresh but empty nest was located nearby. Two young, about one-fifth grown, were observed in a third nest at this location on 26 June 2007 (LDY). The estimated breeding season population of White-winged Doves on St. Croix in 2004 was 75–100 birds. Larger flocks of White-winged Doves have been documented since then, their increased numbers coinciding with their use of a wider range of habitats. At least 165 birds were present at recently harvested, experimental rice plots at La Grange on 7 May 2009 (LDY). On 15 October 2009, 175 birds were counted at or flying over the Buccaneer Hotel Golf Course putt hole 4 area (LDY, SLF). Their populations on St. Croix are expected to continue to consolidate as White-winged Doves occupy more habitats and sites.

***Coccyzus americanus* (Yellow-billed Cuckoo).**—Yellow-billed Cuckoo is generally uncommon during autumn migration (McNair *et al.* 2005) from late September to early November. CCB observed a silent Yellow-billed Cuckoo near Southgate Pond on 3 December 2008, a month later than previous autumn occurrences of this species on St. Croix.

***C. erythrophthalmus* (Black-billed Cuckoo).**—The first reported sighting of the Black-billed Cuckoo in the USVI was a silent individual closely observed on St. Croix as it foraged for caterpillars in an *Acacia* sp. beside Prosperity Pond on 30 September 2006 (LDY). With a cuckoo's general size and shape, the bird's crown, back, and wings were chestnut brown while its belly, throat, and undertail coverts were uniformly light colored. The long tail feathers appeared grey on the underside and were devoid of the obvious large white spots which are characteristic of Mangrove (*C. minor*) and Yellow-billed Cuckoos. Its upper mandible was black and the lower a lighter grey-blue, showing no yellow on the bill. The bird's iris was dark and its orbital ring a dark yellow, consistent with a hatch-year bird. The bird was observed with 8 x 30 binoculars for several minutes from about 4 m. Black-billed Cuckoo is a rare autumn passage migrant in the Greater Antilles and vagrant in the Lesser Antilles (Buckley *et al.* 2009).

***Crotophaga major* (Greater Ani).**—The first USVI record was of a single bird photographed at Rust-op-Twist Salt Pond on 26 October 2010 (CCB, LDY; Fig. 19). On the same day, approximately 800 km away, two birds photographed by Eric Newton in the black mangroves at Schottegat, Curaçao, provided the first record for that island (E. Newton pers. comm.). A first report was also recently documented for Aruba (two birds at Spanish Lagoon on 13 March 2005; Mlodinow 2006, Prins *et al.* 2009) and a record verified for Barbados (one on 22 and 27 April 2011 photographed by Romell Yearwood in Chancery Lane Swamp; E. Massiah and R. Yearwood pers. comm.). These records indicate the species' ability to occasionally disperse to distant Caribbean islands from its normal range in South America.

***Antrostomus carolinensis* (Chuck-will's-widow).**—Chuck-will's-widows were considered a "regular winter visitant" by Beatty (1930). He observed this species on 9 and 12 November (one and two birds, respectively) at Constitution Hill and on 1 and 16 January (one and two individuals, respectively) in the "North Side Woods." Beatty did not provide the years for these pre-



**Fig. 19.** Greater Ani at Rust-op-Twist Salt Pond on 26 October 2010. Photograph by L.D. Yntema.



1930 observations or any details for the two specimens that he collected, and we could not locate either specimen. Beatty later collected a male and a female on 26 December 1937 in moist forest at “Annaly Estate, Sweet Bottom” (USNM 354533 and 354534), and two females at unknown locations, one on 5 March 1940 (FMNH 159698) and the other on 5 January 1941 (FMNH 159697). A fifth specimen, a female, was collected by Seaman on 24 January 1952 in dry forest on Buck Island (ANSP 169904). Seaman (1980) stated that he heard Chuck-will’s-widows calling in the spring shortly before they migrated north, but provided no other details. On 7 February 1979, another female was collected by G. Paralaticci at “Estate Contentment or Herman Hill” (USNM 614995). Thus, one male and five female Chuck-will’s-widows were collected on St. Croix.

In the 1980s, Chuck-will’s-widows were at Great Gut on the western end of St. Croix during three consecutive winter seasons. Three birds were present on 13 February 1983 (FWS, J. Yntema, and M. Yntema unpubl. data) and a single bird remained until 10 March (FWS, J. Yntema, and P. Sladen unpubl. data). On 16 November 1983 (FWS; not 16 October 1983 as reported by Norton [1984a]), one bird was observed at Great Gut and remained through December (FWS and E. Roebuck unpubl. data). On 22 December 1984, an individual was observed there again (FWS, E. Roebuck, S. Roebuck, and R. Norton unpubl. data). Single Chuck-will’s-widows were also observed on 19 January, 4 March, and 26 September 1984 in a dry forest along the beach at Buck Island (FWS unpubl. data; Norton 1985a). The only report of Chuck-will’s-widow on St. Croix since the 1980s was a silent bird observed in mature woods at Jolly Hill on 5 March 2012 (LDY). The reasons for the decline of this species on St. Croix since the 1980s are unknown. In fact, little is known about the population status of this species throughout its range (Straight and Cooper 2012).

***Sphyrapicus varius* (Yellow-bellied Sapsucker).**—On 5 November 2004, a first-year female was at the Sugar Bay mangrove forest (DBM), the same site where a bird was observed in December 2002 (McNair et al. 2005). Although a number of gregre trees (*Bucida buceras*) on St. Croix have old parallel rows of holes, typical evidence of feeding Yellow-bellied Sapsucker (FWS unpublished data; Imsand and Philibosian 1987), this species is rarely observed on St. Croix. Previous occurrences are summarized in McNair et al. (2005).

***Falco columbarius* (Merlin).**—A hatch-year male, originally banded at Seaview, Northampton County, Virginia, on 24 September 2005, was found with a broken wing on St. Croix less than a month later, on 15 October (USGS-BBL). It was euthanized due to the severity of its injury. This banded bird is our only recovery of this uncommon but regular migrant and winter visitor on St. Croix.

***Tyrannus savana* (Fork-tailed Flycatcher).**—One adult male was photographed at William-Prosperity Marsh on 31 August 2006 (LDY; Fig. 20), the first record for the USVI. Another adult male was photographed at Shoys on 10 October 2008 (J. Egnatinsky pers. comm.; Appendix 2.44). These two individuals likely became disoriented during migration, flying north from their austral wintering grounds in northern South America rather than taking their normal route south to their breeding grounds in southern South America (McCaskie and Patten 1994).

***Vireo flavifrons* (Yellow-throated Vireo).**—The first documented occurrences were single birds seen at the Sugar Bay mangrove forest on 27 November and 14 December 1986 (Wauer and Sladen 1992). Twenty years later, single birds were observed there on 25 January and 28 February 2006 (LDY), likely the same individual on both dates. The latter reports suggest this species may have overwintered at Sugar Bay.

***Seiurus aurocapilla* (Ovenbird).**—The Ovenbird was said to be “not common” on St. Croix in the late 1850s (Newton and Newton 1859b) and was considered a “regular winter visitant” in the early 1900s (Beatty 1930). The first two St. Croix specimens, both males, were collected by Newton and Newton on 17 April 1857 at “South Burke” (UMZC 27/Paru/22/a/9) and on 13 March 1858 at “Castle Burke” (UMZC 27/Paru/22/a/11). Four more specimens were collected from 1890 to 1940 (FMNH 26459, 176396, and 127365; USNM 355875; Pashley 1988). Danforth (1930) observed one bird at Anna’s Hope on 28 December 1926, two on 29 December 1926 (female collected, USNM 355875), and three on 2 January 1927. Beatty (1930) reported 4 birds on 15 September, an early date, and high counts of 20 each on 30 December and 1 January, but the years, locations, and details are unknown.

From 1982 through 1988, single Ovenbirds were observed during the following months: October (1986, 1987), November (1984, 1986), December (1988), January (1983–1985), February (1985, 1987), March (1982–1986), and April (1983) (FWS, R. Wauer, E. Roebuck, and P. Sladen unpubl. data; Wauer and Sladen 1992). Most reports were of birds in dry forest on Buck Island, although single observations occurred in moist forest at Great Gut, in mangrove wetlands at Mannings Bay and the Sugar Bay mangrove forest, and in unknown habitat at Solitude Hill.

Ovenbirds have been infrequently observed on St. Croix since



**Fig. 20.** Adult male Fork-tailed Flycatcher at William-Prosperity Marsh on 31 August 2006. Photograph by L.D. Yntema.

the 1980s. Single birds were observed in dry forest on Green Cay in January 2003 (J. Wiley pers. comm.). Single individuals were observed in overgrown pasture scrub at William on 5 October 2006 and from 8 to 13 January 2007 (with two birds present on 27 and 31 January 2007), at Windsor on 13 October 2009, and at Annaly on 4 January 2010 (LDY, CCB).

In contrast to their recent scarcity on St. Croix, Ovenbirds have been more numerous since the 1980s in the northern USVI, especially on St. John, which contains the most extensive mature forest (Pashley 1988, Ewert and Askins 1991, Askins *et al.* 1992, Steadman *et al.* 2009). During December 2005 and 2006, the Ovenbird was one of the five most abundant migrant landbirds in both dry and moist forests on St. John (Steadman *et al.* 2009). On St. Martin, 23 Ovenbirds were captured in secondary dry forest and thorn scrub from January to March, in 2002–2009 (Howard and Brown 2013). In Puerto Rico, however, Ovenbirds have sharply declined over the last 40 yr even though they are still one of the three most numerous species in dry forest (Faaborg *et al.* 2013). The relative inconspicuousness of Ovenbirds during the non-breeding season (Pashley 1988) does not entirely account for their apparent decline as a winter migrant on St. Croix.

***Helmitheros vermivorum* (Worm-eating Warbler).**—Although rare to uncommon on St. Croix, the Worm-eating Warbler (like the Ovenbird) has been reported there during every month from September through April. Observations during January or February in 1966, 1983, 1985, 1987, and 2006 indicate overwintering.

The first records of Worm-eating Warbler on St. Croix are verified by two specimens collected in moist forest at Mt. Eagle on 31 October 1940 and 9 April 1941 (FMNH 151919 and 151920; Beatty 1941). As noted by Pashley (1988), there is some discrepancy between the FMNH dates and those in Beatty's account. Another specimen was collected at Canaan on 12 April 1954 (ANSP 169915; Bond 1966). One bird was observed in moist lowland forest at Bellevue during January 1966 (J. Rappole unpubl. data). VIDFW biologists observed single birds in moist forest near Creque Dam Road on 3 September 1972, in the mangroves at Salt River on 15 March 1973, and at Becks Grove on 1 April 1973 (R. Philibosian and J. Yntema unpubl. data).

From 1982 to 1987, single Worm-eating Warblers were observed 17 times on St. Croix, while two individuals were observed at the same time only once (FWS and R. Wauer unpubl. data; Wauer and Sladen 1992). Before Hurricane Hugo struck in 1989, single Worm-eating Warblers were observed 11 times at the Sugar Bay mangrove forest, once in January 1985 (FWS and R. Wauer unpubl. data) and the others from 8 October 1986 to 11 January 1987, while two birds occurred on 15 November 1986 (Wauer and Sladen 1992). Since then, the only report of this species at Sugar Bay was of a single bird on 5 October 2005 (LDY). In the 1980s, single Worm-eating Warblers were also observed in moist forest at Great Gut (10 February 1983), in dry forest on Buck Island (11 October 1984 and 31 January 1985), in mangrove forest at the Buccaneer Hotel Golf Course (26 November 1984), at Great Pond (21 September 1986), and at an unspecified location (10 October 1987) (FWS, E. Roebuck, and R. Wauer unpubl. data). Since the 1980s, single Worm-eating Warblers were reported only three times outside of Sugar Bay (LDY): in mature moist forest surrounding the gullies above Wills Bay on 25 February

2006 and 15 March 2007 and above Annaly Bay on 5 April 2006.

In the northern USVI, where they remain uncommon (Robertson 1962, Ewert and Askins 1991, Steadman *et al.* 2009), Worm-eating Warblers are associated with mature, moist forest. In Puerto Rico's dry forest, Worm-eating Warblers have sharply declined over the last 10–15 yr (Faaborg *et al.* 2013). Although re-sighting of the same individuals may have accounted in part for the higher number of observations at Sugar Bay in the 1980s, this species appears to have also declined throughout its habitats on St. Croix in recent years.

***Parkesia motacilla* (Louisiana Waterthrush).**—A specimen collected by Beatty at Creque stream on 18 November 1933 verifies the first record of Louisiana Waterthrush on St. Croix (USNM 355910; Danforth 1935). Beatty also collected single specimens on 24 August and 19 September 1939 (FMNH 127364 and 176397; Pashley 1988). Single birds were observed in Kingshill Gut during January 1966 (J. Rappole unpubl. data), "at a freshwater pond" on 20 August 1971 (Leck 1975), at a freshwater pond at Shoys on 28 December 1985 (E. Roebuck, R. Norton, and P. Conchlin unpubl. data), and in northwest St. Croix in 1987 (R. Wauer unpubl. data).

On 3 August 2005, a Louisiana Waterthrush was captured in a mist net near Prosperity Pond and photographed (C. Niebuhr, B. Hanson, and G. Howell unpubl. data; Appendix 2.45). Since then, single birds have been observed along the stream at Caledonia Gut on 3 January and 14 February 2009 (CCB, LDY; R. O'Reilly and D. Janas pers. comm.), in the Oxford Road Gut from 16 to 25 August 2011 (LDY), and in nearby Mahogany Road Gut from 12 to 16 September 2011 (CCB, LDY). Although Louisiana Waterthrush is an early autumn migrant on St. Croix, the winter season occurrences from November to February lend credence to its status as a rare and irregular "overwinterer" on St. Croix (Pashley 1988).

***Vermivora cyanoptera* (Blue-winged Warbler).**—The Blue-winged Warbler is rare on St. Croix from October to April. The first documented reports were single birds observed at the Sugar Bay mangrove forest on four dates from 8 to 26 October 1986 and two birds on 15 November 1986 (R. Wauer unpubl. data; Wauer and Sladen 1992). Blue-winged Warblers were not detected at the Sugar Bay mangrove forest during 2002–2003 surveys (McNair 2008a), but individual birds have subsequently occurred there three times: a male on 30 October 2009 (LDY, CCB), a probable male on 29 January 2010 (LDY), and a female on 9 April 2010 (LDY). In an overgrown pasture, one adult male was observed along a treed fence line at William on 10 January (CCB, LDY), 26 March (LDY), and 9 April 2007 (LDY), probably all the same individual (LDY, CCB). Other than at Sugar Bay, the Blue-winged Warbler has not been detected in moist forest on St. Croix, although it remains uncommon in mature moist forests on St. John in the northern USVI (Askins and Ewert 1991, Askins *et al.* 1992, Pashley 1998, Steadman *et al.* 2009).

***Protonotaria citrea* (Prothonotary Warbler).**—Uncommon from September to April on St. Croix, where it generally occurs in mangrove wetlands, Prothonotary Warbler is seen most often during autumn migration. However, aside from some unsubstantiated Christmas Bird Count reports (see below), four other December and January occurrences suggest some overwintering may occur.

A male collected at “Grange Swamp” on 6 October 1940 (FMNH 151904; Beatty 1941) is the first record of the Prothonotary Warbler on St. Croix. More than 25 yr later, a single bird was observed in mangroves, probably at Fair Plain Gut, in January 1966 (R. Philibosian unpubl. data). Leck (1975) reported that two birds were observed during the 26 December 1972 Christmas Bird Count and one to two birds were reported on six of the seven subsequent counts (Pashley 1988), although few details are available.

In the 1980s, there were seven reports of Prothonotary Warblers: a female at the Buccaneer Hotel Golf Course on 17 October 1981, two males and a female at Great Pond on the same date, a female in the shoreline mangroves at Renaissance Park on 1 March 1982, a male at Altona Lagoon on 16 October 1983, a male at the Buccaneer Hotel Golf Course on 13 January 1985, a male in moist forest at Creque Dam on 11 April 1986, and two birds at the Sugar Bay mangrove forest on 2 October 1988 (FWS and R. Wauer unpubl. data). Prothonotary Warblers were not recorded at Sugar Bay during 1986–1987 surveys (Wauer and Sladen 1992), but 7 of the 11 single occurrences of Prothonotary Warblers since 2002 have been at that site: on 20 October 2002 (McNair 2008a), 5 November 2004 (DBM), 5 October and 10 November 2005 (LDY), 12 October 2006 (LDY), 27 December 2007 (LDY), and 30 October 2009 (LDY, CCB). The other four observations were at William-Prosperity Marsh on 14 November 2006, at Mountain Mint Dairy Lower Pond #1 (in Petronella) on 12 April 2007, and at Great Pond on 25 September 2008 and 7 December 2011 (LDY).

***Geothlypis trichas* (Common Yellowthroat).**—Common Yellowthroat is usually more abundant in mangrove wetlands than in other habitats in the Greater Antilles (Wunderle and Waide 1993), but on St. Croix most occurrences of this generally uncommon winter resident have been in the vegetated edges of freshwater wetlands. From August 2004 through July 2012, Common Yellowthroats were observed each winter and were more numerous than previously documented (see McNair et al. 2005), especially during years when unusually wet environmental conditions were created by heavy rainfall (Fig. 1). From 15 October to 5 May this species occurred at 24 sites, 21 freshwater and 3 saline (Southgate Pond, Great Pond, and Buccaneer Hotel Golf Course putt hole 4 pond). During three of the eight winters since 2004, two to three individuals were present at Fredensborg Pond and Granard South Pond, and during one winter at Glynn South Pond, Lowry Hill Road North Pond, and in the non-mangrove, vegetative fringe of Southgate Pond (LDY, CCB, SLF).

***Setophaga citrina* (Hooded Warbler).**—Uncommon from October to April on St. Croix, Hooded Warbler primarily occurs in moist forests, including mangrove wetlands. The first record was a male collected on 16 or 17 March 1941 (FMNH 176575; Beatty 1941, Pashley 1988). Other museum specimens include single males collected by Beatty on 6 April 1945 (USNM 388831) and by Seaman on 14 March 1954 at Canaan (ANSP 169928). In the 1980s, an immature Hooded Warbler was observed at Coakley Bay Salt Pond on 23 February 1982 (FWS, R. Norton, and J. Yntema unpubl. data), a female at Renaissance Park on 16 October 1983 (FWS unpubl. data), and a male at Caledonia Gut on 19 January 1987 (FWS and R. Wauer unpubl. data).

Also in the 1980s, at the Sugar Bay mangrove forest, single

birds were reported five times from 8 to 26 October 1986, with some probable re-sightings of the same individual, and three birds were observed on 15 November (FWS, R. Wauer, and A. Dempsey unpubl. data; Wauer and Sladen 1992). Hooded Warblers also occurred in this forest after Hurricane Hugo, where this species was closely associated with the swamp fern (*Acrostichum danaeifolium*) during 2002–2003 surveys (McNair 2008a). A more recent occurrence at Sugar Bay was one adult male on 16 December 2006 (LDY).

Recent occurrences of Hooded Warblers in upland moist forests in northwest St. Croix include within-season site persistence of four unmarked individuals that repeatedly used the same nocturnal roosts or late afternoon bathing sites in the adjoining Oxford and Jolly Hill estates: an adult male roosted at dusk within a 25 m<sup>2</sup> stand of mature genip trees (*Melicoccus bijugatus*) near the Oxford Road Gut from 10 January to 13 March 2006 (LDY; Appendix 2.46), an adult male roosted 0.8 km away in an isolated gregre tree at Jolly Hill from 2 November 2009 to 4 April 2010 (LDY; Appendix 2.47), an adult male frequently bathed in the late afternoon at a small pool in the Oxford Road Gut at Jolly Hill from 11 February to 15 March 2011 (LDY), and a female regularly bathed and preened at the same pool in the Oxford Road Gut from 12 December 2011 to 18 April 2012 (LDY). Both sexes produced loud chip calls during these activities, so birds were easy to detect.

Additional recent observations, usually in similar upland moist forests, include single adult males at Jolly Hill on 27 October 2008, at Mahogany Road Gut on 5 January 2009, and at the Oxford Road Gut on 28 January 2012 (LDY). A male was also in a brush pile adjacent to the Carambola Golf Course on 27 October 2009 (CCB, LDY), and single females were at William-Prosperity Marsh on 22 January and 9 April 2007 (LDY) and at Brookshill on 1 November 2009 (CCB).

***S. tigrina* (Cape May Warbler).**—Cape May Warblers are habitat generalists on their winter range (Latta and Faaborg 2002), including St. Croix where they have been present from September to April. Early evaluations of this species' status as an uncommon winter resident (Newton and Newton 1859b) and “regular winter visitant” (Beatty 1930) are consistent with specimen evidence that these and other individuals collected. The first Cape May Warbler documented on St. Croix was a male collected at Castle Burk on 19 March 1857 by Newton and Newton (1859b; UMZC 27/Paru/6/w/16). Cory (1891) listed Cape May Warbler as one of the species collected on St. Croix during March and April 1890. We were unable to locate a specimen from that year, but a male was collected by C.S. Winch on 21 January 1891 (FMNH 10782). Beatty (1930) observed Cape May Warblers at Constitution Hill from 8 September to 19 April (probably in the 1920s but no years were specified), including eight birds on 1 January. Seven of the eight specimens collected by Beatty from 12 December 1939 to 9 April 1941 remain at FMNH (Pashley 1988). The most recent specimen (ANSP 169918) is a female collected on 29 April 1954 by Seaman at Canaan.

In the 1980s, from 1981 to 1987, Cape May Warblers were reported more than 50 times at a variety of locations over the western half of the island (FWS unpubl. data; Wauer and Sladen 1992). December was the most common month for observations (6 yr), followed by November, January, and March (4 yr



each), then by October, February, and April (2 yr each). Multiple individuals were recorded at single locations in two different habitats, in trees at the UVI campus and in the Sugar Bay mangrove forest. At UVI, two to four individuals were present on five dates from 24 March to 18 April 1982 and two to three birds were recorded on five dates from 2 December 1982 to 17 January 1983. At Sugar Bay, two to three individuals were observed on four dates from 25 October 1986 to 11 January 1987.

Cape May Warblers continued to be uncommon though widely distributed at 23 locations across St. Croix in a variety of habitats from autumn 2004 through spring 2012 (LDY, CCB, DBM, SLF, and L.E. Yntema), evidence that is consistent with its status during historical periods on St. Croix although annual numbers may fluctuate (i.e., not observed in 2010 and 2012). Cape May Warblers were observed 25 times at 15 freshwater sites, four times at three saline sites (Great Pond, Sugar Bay mangrove forest, and UVI Wetlands Reserve), eight times in two overgrown pastures (Prosperity and William), and four times in trees near three human habitations (Belvedere, Frederiksted, and Jolly Hill). In addition, one Cape May Warbler was banded in January 2009 and two in January 2011 in dry shrubland surrounding several saline wetlands at Sandy Point NWR (CDL unpubl. data; Appendix 2.48).

***S. magnolia* (Magnolia Warbler).**—Magnolia Warbler has been an uncommon winter resident on St. John since at least the late 1950s (Steadman et al. 2009), but has only been a rare migrant and winter resident on St. Croix, where the first documented report did not occur until 15 March 1984 when an immature bird was observed in moist forest of Canaan Ridge (Sladen 1988). Single birds were present at the Sugar Bay mangrove forest on three dates, 19 October 1986, 14 December 1986, and 31 March 1987 (Wauer and Sladen 1992), and at Caledonia Gut on 31 March 1987 (FWS and R. Wauer unpubl. data). The only other report at the Sugar Bay mangrove forest since the 1980s was a male on 7 November 2006 (LDY).

Five single Magnolia Warblers were observed at two other sites from 2005 through 2007. An adult male in breeding plumage was observed on 28 April 2005 in an overgrown pasture at William (LDY). A second-year female on 31 January 2007 (LDY) and an adult male on 23 November 2007 (CCB) were also observed at this site. Single females were recorded at the William-Prosperity Marsh on 5 October 2006 and 22 January 2007 (Appendix 2.49), the latter possibly the same bird seen 9 days later in the nearby William pasture (LDY).

***S. pennsylvanica* (Chestnut-sided Warbler).**—Chestnut-sided Warblers have been reported only three times on St. Croix, all single birds observed in the first half of October. The first two were in bamboo, shrubs, and tall grass at Spring Garden and in moist forest at Creque Dam on 11 October 1987 (FWS and R. Wauer unpubl. data; Norton 1988a). The third bird was observed at Castle Nugent Lower Pond on 2 October 2004 (DBM). The Chestnut-sided Warbler is very rare throughout the Lesser Antilles (Brown and Collier 2003).

***S. caerulea* (Black-throated Blue Warbler).**—A rarely observed winter resident on St. Croix, Black-throated Blue Warbler was first verified there when an adult male was collected “on the slopes of Annaly” on 26 February 1938 (USNM 355769; Beatty 1939). Another male (ASNP 169919) was collected at Canaan by

Seaman on 23 March 1954 (*contra* Pashley 1988). In the 1980s, a male and female were observed at Caledonia Gut on 16 January 1982 and a male was at Great Gut on 30 October 1985 (FWS unpubl. data). The most recent occurrences were single adult males, one near the crest of Wills Bay Gut on 25 February 2006 (LDY) and the other at the Sugar Bay mangrove forest on 21 December 2009 (LDY, CCB).

In the northern Virgin Islands, Black-throated Blue Warblers have been rare to uncommon (Robertson 1962, Askins et al. 1992, Wunderle and Waide 1993, Steadman et al. 2009) with several records suggesting birds may overwinter there as on St. Croix. On St. Martin (Howard and Brown 2013), the numerous recent records (2002–2009) of Black-throated Blue Warblers captured in secondary dry forest during winter (January to March) suggest this species may have been under-detected on St. Croix. Most Black-throated Blue Warblers on St. Martin have been males, as on St. Croix.

***S. palmarum* (Palm Warbler).**—Previous occurrences of this uncommon winter resident are summarized in McNair et al. (2005). Individual Palm Warblers continued to occur infrequently (six reports) from autumn through spring in scrub bordering wetlands: at Fredensborg Pond on 27–31 January 2005 (LDY, SLF, CCB), at the VIDA Middle Pond on 31 March 2005 (LDY), at Great Pond on 5 December 2006 (LDY) and on 18 November 2010 (LDY), at Granard South Pond on 9 January 2008 (LDY), and along the west road to Mannings Bay on 16 December 2011 (LDY).

***S. dominica* (Yellow-throated Warbler).**—Rare and irregular on St. Croix, Yellow-throated Warbler was first reliably documented each year from 1982 to 1986, with observations during three of those winters. A single bird was observed in trees at the UVI parking lot 26 times during those 5 yr, on dates ranging from 13 October to 25 March (FWS, E. Roebuck, S. Roebuck, and R. Norton unpubl. data). It is possible this bird was the same individual, although two birds were seen at UVI on 20 December 1982 and 2 December 1984. On 15 October 1983, one individual was at nearby Castle Burk Pond while another was observed the same day at UVI (FWS and R. Wauer unpubl. data).

Since 2004, Yellow-throated Warblers have only been observed four times: an individual foraging in vines hanging from a tibet tree (*Albizia lebeck*) at Brookshill on 17 March 2007 (CCB), one hover-gleaning among the outer branches of a *Eucalyptus* sp. at nearby Jolly Hill on 21 March 2007 (LDY), and another foraging in black mangroves at the Sugar Bay mangrove forest on 24 January and 4 April 2009 (LDY). The Yellow-throated Warbler appears to be a habitat generalist on St. Croix, having been observed feeding in a developed inland area, semi-moist upland habitats, and mangrove forest. In contrast, Hayes et al. (2008) documented its more restricted use of “semi-open coastal” habitat with scattered palms in the northern USVI.

***S. virens* (Black-throated Green Warbler).**—A very rare autumn and vernal migrant on St. Croix, Black-throated Green Warblers were first reported there in 1919 (Beatty 1930). Although Beatty stated he collected a male and female at Constitution Hill on 18 October 1919, neither specimen was located (Pashley 1988, this study). Three others collected by Beatty in April and May 1941 and in September 1942 are at the Field Museum (FMNH 176258–176260). In the 1980s, a single male was



Fig. 21. Adult male grackle near Christiansted on 18 March 2009. Photograph by C. Cramer-Burke.

observed at the Sugar Bay mangrove forest on 2 October 1988 (FWS and R. Wauer unpubl. data). Since 2002, only four single birds have been reported: a female or first-year male at William Pond on 28 and 30 November 2007 (LDY, CCB), an adult male foraging in a hog plum tree (*Spondias mombin*) at a Jolly Hill residence on 1 May 2009 (LDY), an adult male in moist forest at Creque Dam Reservoir on 9 October 2009 (LDY, CCB), and a female or first-year male in small mangroves at Southgate Pond on 12 October 2009 (CCB).

***Loxigilla noctis* (Lesser Antillean Bullfinch).**—Lesser Antillean Bullfinch remains uncommon and not widely distributed in northwestern St. Croix, although range consolidation is still occurring. Breeding was confirmed again at Creque Dam Reservoir on 31 October 2007 (JMV). A female was on a nest at Mt. Victory, a new breeding site, on 10 June 2009 (LDY). Pairs actively building nests at three other new sites (LDY) confirmed breeding at Libanon Hill on 24 August 2006, William on 5 and 25 July 2011, and Jolly Hill on 5 April 2012. Previous occurrences in the USVI are summarized in McNair et al. (2005).

***Piranga olivacea* (Scarlet Tanager).**—Six of the nine occurrences of Scarlet Tanagers on St. Croix were single birds observed during spring migration in April. The first occurrence was of an adult male shot while feeding in a turpentine tree (*Bursera simaruba*) in Peters Rest on 20 April 1919 (Beatty 1930). Although the whereabouts of this specimen is unknown, two specimens collected on St. Croix in 1940, a female on 20 April and a male on 21 April, are at the Field Museum (FMNH 177193 and 177192). In the 1980s, an immature bird was observed on 13 September 1986 at Great Pond (Norton 1987) and another bird was at Sandy Point NWR on 5 October 1988 (FWS unpubl. data). Since 2003, single individuals have been observed four times on St. Croix: an adult male at La Vallee in April 2003 (B. Luria pers. comm.), an adult male at the Buccaneer Hotel on 15 February 2007 (E. Fisher pers. comm.), a female at William on 16 April 2008 (LDY), and an adult male photographed at a feeder in Sprat Hall on 17 April

2008 (B. Merwin pers. comm.; Appendix 2.50). Similar to the St. Croix observations, all three recent occurrences (2003–2011) in the northern Virgin Islands were single males observed in April (B. Tyne, R. White, and VIDFW unpubl. data). Avian studies conducted over the last 20 yr in the northern USVI during autumn and winter did not document any Scarlet Tanagers (Askins and Ewert 1991, Askins et al. 1992, Steadman et al. 2009).

***Phœucticus ludovicianus* (Rose-breasted Grosbeak).**—Usually a very rare spring migrant on St. Croix (McNair et al. 2005), a Rose-breasted Grosbeak male was observed at William on 9 April 2009 (CCB, LDY). The first two winter reports of this species were an adult female in tall *Acacia* sp. scrub at William on 31 January 2007 (LDY) and a male and female at Windsor on 17 January 2009 (LDY, CCB).

***Passerina caerulea* (Blue Grosbeak).**—Blue Grosbeaks have been reported only four times on St. Croix: two birds at Sandy Point NWR on 12 October 1987 (Norton 1988a), one bird at the UVI agricultural plots from 13 March to 12 April 1988 (Norton 1988b), a female near Brookshill Pond on 5 December 2008 (LDY), and another female observed near William Pond on 22 February 2012 (L.E. Yntema and LDY).

***Quiscalus niger* (Greater Antillean Grackle) or *Q. lugubris* (Carib Grackle).**—An alert and wary adult male grackle was heard giving a 'trill' vocalization, observed displaying ('ruff-out' with raised tail), and photographed near Christiansted, St. Croix, on 18 March 2009 (CCB; Fig. 21). This bird was thought to be wild due to its behavior and because the plumage was in fine condition, unlike escaped caged birds that typically show considerable feather wear. This individual's primary song was not heard so it was not possible to distinguish between the two above grackle species (A. Jaramillo pers. comm.). The nearest wild population of either species to St. Croix is the Greater Antillean Grackle on Vieques Island (Gemmill 2015), located approximately 60 km away. Greater Antillean Grackles were introduced to St. Croix around 1917 (Beatty 1930), but did not become established.

***Icterus galbula* (Baltimore Oriole).**—The first report from St. Croix was one bird seen during the 22 December 1984 Christmas Bird Count (R. Norton, E. Roebuck, and S. Roebuck unpubl. data; Sladen 1987). Since 2005, Baltimore Orioles have been seen on seven occasions on St. Croix: an adult male near Windsor South Pond on 17 March and 5 April 2005 (LDY), an adult male at Concordia (Northeast) on 7 May 2007 (M. Baron pers. comm.), two first-year birds at Windsor on 20 November 2008 (LDY, SLF), an adult male at the Sugar Bay mangrove forest on 24 January 2009 (LDY), an adult male about 1 km away at Windsor on 19 March 2009 (LDY, CCB), and an adult male and adult female at the Sugar Bay mangrove forest on 4 April 2009 (LDY). Although most St. Croix occurrences have been during spring migration, reports from December and January suggest the possibility of occasional over-wintering.

## Discussion

### Avifaunistics

From 2002 to 2012, we conducted year-round avian surveys with emphasis on site-specific breeding evidence at the saline ponds on St. Croix, and for the first time, at almost all of the man-made freshwater ponds as well. While increased survey efforts are partially responsible for the pronounced increase

in confirmed nest records, some real positive avian population changes are associated with a general increase in rainfall over this decade. Our recent data, in conjunction with assessment of results from the 1980s and other historical evidence, suggest that resident, partial migrant, or migrant species that increased in abundance and distribution in saline, freshwater, or terrestrial habitats on St. Croix since 2002 include White-cheeked Pintail, Masked Duck, Ruddy Duck, Least Grebe, Pied-billed Grebe, Green Heron, Common Gallinule, American Coot, White-crowned Pigeon, Bridled Quail-Dove, White-winged Dove, and Common Yellowthroat.

While locally abundant rainfall from 2002 to 2012 enabled some avian population increases on St. Croix, some of these species also expanded their ranges within the Caribbean during this period. Masked Duck likely colonized St. Croix from Puerto Rico, where large numbers of this species were recorded in recent years (Eitniear and Colón-López 2005, Eitniear and Morel 2012). Ruddy Duck has either expanded its range or reoccupied its former breeding range (Brown and Collier 2004), south to the central Lesser Antilles. White-winged Dove has also expanded its range south and east to the central Lesser Antilles over the past decade (Larsen and Levesque 2008, Francis 2012, Levesque 2013). Thus, recent movements of species from within the Greater Antillean region to St. Croix have apparently predominated over movements from the eastern and southern Lesser Antillean region (see also Robertson 1962).

Some breeding waterbirds and landbirds on St. Croix have recently received detailed treatment (Ruddy Duck: McNair *et al.* 2006b; Least Grebe: McNair *et al.* 2008; American Coot: McNair 2005, McNair and Cramer-Burke 2006; Least Tern: Lombard *et al.* 2010; and White-crowned Pigeon: McNair 2008b). New information acquired during this study has augmented and reinforced conclusions from those previous studies in addition to provoking reevaluation of some issues such as the increase in breeding of White-crowned Pigeons on Ruth Island and Great Pond. Least Grebe population growth and distribution expansion on St. Croix does not appear to have been hampered by the presence of the more common Pied-billed Grebe. Confirmation of White-tailed Tropicbird nests through 2012 showed that its small colony on St. Croix has persisted. Some uncommon breeding resident or partial migrant species on St. Croix that have yet to receive detailed treatment include American Oystercatcher, Willet, Bridled Quail-Dove, Antillean Nighthawk (*Chordeiles gundlachii*), and Caribbean Martin (*Progne dominicensis*).

Sixty-seven non-breeding avian species are documented herein, including four new verified species (Curlew Sandpiper, Great Black-backed Gull, Greater Ani, and Fork-tailed Flycatcher), one verified grackle of undetermined species (Greater Antillean or Carib), and an unverified sighting of one additional new species (Black-billed Cuckoo). Some secretive or rare species that remain unconfirmed on St. Croix, such as Swainson's Thrush (*Catharus ustulatus*) that was recently verified during autumn migration on nearby Guana Island, British Virgin Islands (Boal *et al.* 2006, Boal and Estabrook 2007), have undoubtedly been overlooked. The vagrants, scarce transients, and uncommon species with recent occurrences documented in this study are dominated by the expected avian taxonomic groups (i.e., shorebirds, larids, and warblers) on St. Croix. Offshore and pelagic seabirds were

under-sampled, although this group received greater effort in the 1980s (FWS unpubl. data).

In the early 2000s, focused avifaunal surveys were also conducted on a number of other small to medium-sized islands in the eastern and southern Caribbean: Anegada (McGowan *et al.* 2007); St. Martin (Brown and Collier 2004, 2005, 2007, Brown and Brindock 2011); Guadeloupe and dependencies (Levesque *et al.* 2005, Levesque and Yésou 2005, Levesque and Saint-Auret 2007, Levesque and Sorenson 2012); Barbados (Buckley *et al.* 2009); the Lesser Antilles (Prins *et al.* 2005); and Aruba, Curaçao, and Bonaire (Prins *et al.* 2009). Other islands in the eastern and southern Caribbean have received considerably less effort recently, including the northern USVI where year-round decadal-length surveys were last conducted by Norton and associates from the late 1970s to the late 1980s (Norton 1979, 1981a, Norton and Hobbs 1987). Intensive avifaunal surveys not only benefit the understanding of the bird communities on the individual islands, but contribute to the overall knowledge of Caribbean bird populations and inter-island movement.

### Conservation Priorities

Platenberg *et al.* (2005) proposed a revised list of the territorial statutory status of Endangered, Threatened, and Special Concern species within the USVI to replace the outdated list (U.S. Virgin Islands Endangered and Indigenous Species Act of 1990). The USVI government has not enacted these recommendations. Understanding species population fluctuations, especially for the semi-arid environments of St. Croix, is critical to assessment and assignment of a species' statutory status within the USVI. Rainfall is the most important environmental driver for fluctuations in breeding populations of many waterbirds and some landbirds on St. Croix, and for regional meta-population movements to and from St. Croix. Populations of many avian species are higher during flush rainfall years, when conditions are improved for waterbirds and for passerines including some overwintering migrants in upland forests (e.g., warblers), and lower during extreme drought years. Ideally, systematic surveys should be conducted to track dry- and wet-season movements of many waterbirds on St. Croix to determine their semi-annual population fluctuations (Valiulis 2009).

Marked birds recovered or re-sighted on St. Croix that were originally banded along the eastern seaboard of North America (and one egret from Ontario) help us understand movements of some species from North America to the Caribbean. Re-sightings of individual shorebirds over multiple years indicate that such return to and reuse of winter habitat or stopover sites may be more prevalent than was previously appreciated. Only one species (Brown Booby) marked in the Caribbean but outside St. Croix was recovered on St. Croix. Banding efforts on St. Croix have been negligible, except for the White-crowned Pigeon in the 1950s (Norton and Seaman 1985). The very low level of banding and other efforts to individually mark birds on St. Croix (though see Lombard *et al.* 2010) has greatly hindered our understanding of regional meta-population movements including those of locally important species such as the White-cheeked Pintail and Wilson's Plover.

Nonetheless, the long though somewhat disjointed historical record of the avian populations of St. Croix beginning in 1859,



coupled with FWS's decade-long surveys in the 1980s and our surveys from 2002 through July 2012, allow us to cautiously recommend two modifications to the Platenberg *et al.* (2005) proposed territorial statutory list of avian species. 1) Downlist Least Grebe from Locally Endangered to Locally Threatened: Least Grebe is a restricted site species, but recent occurrences at many freshwater sites (including in the northern USVI; McNair *et al.* 2008) during flush rainfall years demonstrate that habitat, while not protected, is not currently limiting. 2) Downlist American Coot from Locally Threatened to Local Special Concern: American Coot is a restricted site species whose primary breeding site is protected. During flush rainfall years, American Coots will breed at a limited number of freshwater ponds that remain unprotected. Delist two species. 1) White-cheeked Pintail is a widespread species with well-documented population fluctuations and habitat is not limiting. 2) Ruddy Duck is a restricted site species whose primary breeding site is fully protected. Despite recent flush rainfall years, it has been demonstrated that the Ruddy Duck rarely breeds away from Southgate Pond, a protected wetland. Only one old and one new saline breeding site otherwise exist in the USVI.

Rather than focus on statutory assignment of avian species, we believe that creation of fully protected reserves is a better way to improve and maintain population levels of breeding and non-breeding waterbirds and landbirds on St. Croix. Southgate Pond, within Southgate Coastal Reserve, has demonstrably improved conditions for the Ruddy Duck, American Coot, and other avian species, as is re-affirmed by this study. Great Pond, Ruth Island, and an array of freshwater ponds need to be designated as reserves with all the protection of that status. Ruth Island is currently designated as a territorial special wildlife area and protection has improved in recent years. However, neither Great Pond nor Ruth Island fully functions as a wildlife reserve to improve or protect population levels of some species (e.g., White-crowned Pigeon). Once this is achieved, the process of downlisting or delisting of other avian species in the USVI could probably proceed.

The Sugar Bay mangrove forest is locally critical for Nearctic-Neotropical migrant parulids during migration and over winter. Several of those warblers, such as the Prothonotary and Hooded Warblers, are conservation priorities (Platenberg *et al.* 2005). The intermittent, long-term censuses at the Sugar Bay mangrove forest (LDY and CCB unpubl. data; Wauer and Sladen 1992, McNair 2008a) have been the only monitoring conducted for migrant landbirds on St. Croix, aside from general survey work. Fortunately, the Sugar Bay mangrove forest is already fully protected as it lies within Salt River Bay National Historical Park and Ecological Preserve. Elsewhere, our general survey work has documented an increasing number of migrant landbirds (especially warblers) present in the greater amount of available secondary woodland that has reverted from pastures as a result of the recent, sharp reduction in the number of livestock and above normal rainfall. Protection of an array of upland habitats will require focused studies, assessment, and prioritization. Howard and Brown (2013) discuss preservation of upland secondary woodland for forest migrants on St. Martin, an issue which should also be investigated on St. Croix.

Aside from the partial migrant White-crowned Pigeon and

the uncommon summer resident Antillean Nighthawk and Caribbean Martin, the year-round resident Bridled Quail-Dove is the only breeding landbird that is a conservation priority on St. Croix. As such, some guts and surrounding forest, this latter species' primary habitat, should receive formal protection.

Most resident landbirds on St. Croix are habitat generalists. They have had a stable species composition, despite substantial anthropogenic activities over centuries, so they are not currently a conservation priority. Nonetheless, some habitats other than saline wetlands (e.g., select freshwater ponds, upland ecosystems, streambeds, and gullies) on St. Croix should receive full protection as wildlife reserves to help meet territorial statutory protection for locally important and migratory species that depend on these habitats.

Except for the protocols used in intermittent long-term monitoring at the Sugar Bay mangrove forest and two short-term monitoring studies of three species of common resident columbids (DBM unpubl. data; Nellis *et al.* 1984), no monitoring protocol exists to document temporal population trends for resident landbirds (see Boal *et al.* 2013) on St. Croix. Such monitoring protocols should be developed and implemented in order to inform future conservation priorities.

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**Appendix 1.** Abbreviations used in the text.**Authors**

AOL	Antonia O. Lance
CCB	Carol Cramer-Burke
CDL	Claudia D. Lombard
DBM	Douglas B. McNair
FWS	Fred W. Sladen
JMV	Jennifer M. Valiulis
LDY	Lisa D. Yntema
SLF	Sheelagh L. Fromer

**Museums—Specimen Information**

ANSP	Academy of Natural Sciences of Drexel University
FMNH	Field Museum of Natural History
UMZC	University Museum of Zoology
USNM	United States National Museum (now National Museum of Natural History)

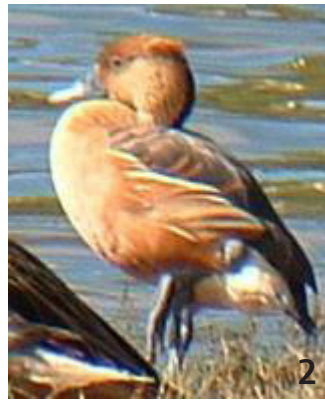
**Banding Information**

NJDFW	New Jersey Department of Environmental Protection, Division of Fish and Wildlife
USGS-BBL	United States Geological Survey, Bird Banding Laboratory
VIDFW	Virgin Islands Department of Planning and Natural Resources, Division of Fish and Wildlife

**Other Acronyms**

AES-UVI	Agricultural Experiment Station, UVI
HOVENSA	Hess Corporation and Petr6leos de Venezuela (oil refinery)
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USNPS	United States National Park Service
USVI	United States Virgin Islands
UVI	University of The Virgin Islands
VIDA	Virgin Islands Department of Agriculture





**Appendix 2.** 1) Black-bellied Whistling-Duck at Southgate Pond on 9 September 2008. Photo by CCB. 2) Fulvous Whistling-Duck at Buccaneer Hotel Golf Course on 18 August 2004. Photo by CCB. 3) One of two Hooded Merganser females at Coakley Bay Salt Pond on 10 February 2009. Photo by LDY. 4) Hooded Merganser female at Great Pond on 28 December 2010. Photo by LDY. 5) Masked Duck male in alternate plumage at Prosperity Pond on 16 November 2005. Photo by LDY. 6) Masked Duck female at Upper Love Pond on 11 April 2008. Photo by LDY. 7) Masked Duck male in alternate plumage at Longford Lower Pond on 3 December 2010. Photo by LDY. 8) Ruddy Duck eggs in an old American Coot nest at Southgate Pond on 8 November 2008. Photo by CCB. 9) Ruddy Duck eggs in an old Common Gallinule nest at Southgate Pond on 28 January 2009. Photo by CCB.





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**Appendix 2.** cont. 10) American Flamingo adult at Renaissance Mangrove Remnant Wetland on 18 July 2012. Photo by LDY. 11) White-tailed Tropicbird in a nest crevice at Canegarden Bay on 17 April 2011. Photo by AOL. 12) White-tailed Tropicbird leaving a nest crevice at Canegarden Bay on 5 April 2012. Photo by LDY. 13) Glossy Ibis at Rust-op-Twist on 16 October 2005. Photo by LDY. 14) Glossy Ibis at Lowry Hill Road North Pond on 31 January 2009. Photo by CCB. 15) Glossy Ibis at Castle Burk Pond on 3 September 2009. Photo by LDY.





**Appendix 2. cont.** 16) Purple Gallinule adult at Buccaneer Hotel Waste Water Treatment Pond on 23 March 2007. Photo by CCB. 17) Purple Gallinule adult at Castle Burk Pond on 7 April 2009. Photo by LDY. 18) Purple Gallinule immature at VIDA Upper Pond on 12 October 2010. Photo by SLF. 19) Purple Gallinule immature at Prosperity Pond on 21 March 2011. Photo by LDY. 20) Snowy Plover at West End Salt Pond on 14 August 2009. Photo by LDY. 21) Piping Plover at Chenay Bay beach on 17 September 2008. Photo by CCB. 22) Wilson's Plovers on Halfpenny Bay Beach on 30 January 2008. Photo by LDY. 23) Wilson's Plovers at Great Pond on 29 December 2010. Photo by LDY. 24) Upland Sandpiper at Great Pond on 11 October 2010. Photo by LDY.





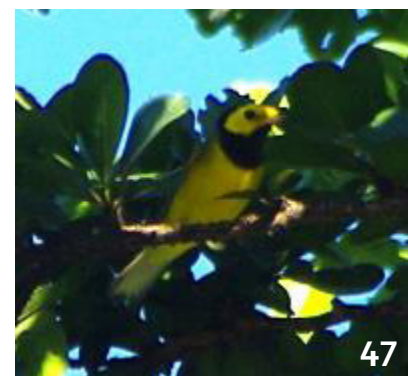
**Appendix 2. cont.** 25) The Whimbrel called "Hope" with transmitter at Great Pond on 7 December 2011. Photo by LDY. 26) Hudsonian Godwits at VIDA Lower Pond overflow on 17 October 2005. Photo by LDY. 27) Hudsonian Godwits at VIDA Lower Pond overflow in October 2010. Photo by SLF. 28) One of two Hudsonian Godwits at Mount Fancy Salt Pond on 28 October 2011. Photo by LDY. 29) Ruddy Turnstone with engraved flag (lime) TP7 at Frederiksted Public Beach on 23 August 2011. Photo by LDY. 30) Ruddy Turnstone with engraved flag (lime) C0H at the Christiansted boardwalk on 20 October 2010. Photo by SLF. 31) Red Knot with engraved flag (lime) HUN at Southgate Pond on 5 September 2008. Photo by CCB. 32) Sanderling with engraved flag (lime) PTH at Mannings Bay West beach on 8 April 2008. Photo by LDY. 33) Sanderling with engraved flag (lime) 1VX at Great Pond Bay on 13 September 2010. Photo by LDY. 34) Semipalmated Sandpiper with engraved flag (yellow) MMJ at Halfpenny Mangrove Wetland on 30 August 2011. Photo by LDY.





**Appendix 2.** cont. 35) Wilson's Phalarope at Krause Lagoon Remnant on 30 September 2010. Photo by LDY. 36) Wilson's Phalarope at Great Pond on 13 September 2011. Photo by LDY. 37) Ring-billed Gull immature at Frederiksted Public Beach on 18 December 2010. Photo by LDY. 38) Lesser Black-backed Gull at Southgate Pond on 1 May 2012. Photo by CCB. 39) Gull-billed Tern at Great Pond on 9 August 2007. Photo by LDY. 40) Black Tern at Southgate Pond on 31 August 2005. Photo by CCB. 41) Black Tern killed at Canegarden Bay on 20 September 2010. Photo by AOL. 42) Common Tern adult and immatures at Frederiksted Public Beach on 3 October 2006. Photo by LDY.





**Appendix 2.** cont. 43) Bridled Quail-Doves at Jolly Hill on 25 March 2008. Photo by LDY. 44) Fork-tailed Flycatcher male at Shoys on 10 October 2008. Photo by Judy Egnatinsky. 45) Louisiana Waterthrush near Prosperity Pond on 3 August 2005. Photo by Chris Niebuhr. 46) Hooded Warbler male near Oxford Road Gut on 11 March 2006. Photo by LDY. 47) Hooded Warbler male at Jolly Hill on 9 January 2010. Photo by LDY. 48) Cape May Warbler male captured and banded at Sandy Point National Wildlife Refuge on 16 January 2011. Photo by LDY. 49) Magnolia Warbler at William-Prosperity Marsh on 22 January 2007. Photo by LDY. 50) Scarlet Tanager at Sprat Hall on 17 April 2008. Photo by Becky Merwin.

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