

HISTORICAL BREEDING DISTRIBUTION AND ABUNDANCE OF THE WHITE-CROWNED PIGEON (*PATAGIOENAS LEUCOCEPHALA*) ON ST. CROIX, US VIRGIN ISLANDS

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Abstract: I critically assessed historical data (before 2002) on the breeding distribution and abundance of the White-crowned Pigeon (*Patagioenas leucocephala*) on St. Croix, US Virgin Islands, since the first confirmed breeding record in 1858. White-crowned Pigeons have formed moderate to large colonies at three colony sites, two cays (Green Cay, Ruth Island) and a mangrove wetland (the former Krause Lagoon; destroyed in 1962), although only one of these three colony sites has ever been documented to be a large active colony at a given time. The largest certain documented site was at the former Krause Lagoon, where up to 600 birds nested in the 1950s, although the colony at Green Cay in the 1910s and 1920s may have been much larger. Historical data for the White-crowned Pigeon on St. Croix are generally sparse because of insufficient observer effort, and the difficulty of obtaining reliable population estimates is further compounded because of poaching of adults and squabs at the largest colony sites, most recently at Ruth Island, a man-made cay located just south of the former Krause Lagoon.

Key words: abundance, colony site, distribution, Green Cay, Krause Lagoon, *Patagioenas leucocephala*, poaching, Ruth Island, St. Croix, US Virgin Islands, White-crowned Pigeon

Resumen: DISTRIBUCIÓN DE HISTÓRICA DE CRÍA Y ABUNDANCIA DE LA PALOMA CABECIBLANCA (*PATAGIOENAS LEUCOCEPHALA*) EN ST. CROIX, ISLAS VÍRGENES DE EEUU. Se realizó una revisión crítica de los datos históricos (anteriores al 2002) acerca de la distribución de cría y la abundancia de la Paloma Cabeciblanca (*Patagioenas leucocephala*) en St. Croix, Islas Vírgenes de EEUU, desde el primer registro confirmado de su cría en 1858. La Paloma Cabeciblanca ha formado colonias de moderadas a grandes en tres localidades, dos cayos (Green Cay, Ruth Island) y un manglar (la antigua Laguna Krause; destruida en 1962). Solo una localidad ha sido documentada actualmente como una gran colonia activa. El mayor sitio documentado fue el de la antigua Laguna Krause, donde hasta 600 aves anidaron en la década de los años 50, aunque la colonia en Green Cay, alrededor de 1910 y 1920, podría haber sido mucho mayor. Los datos históricos para la Paloma Cabeciblanca en St. Croix son generalmente escasos a causa de un insuficiente esfuerzo de observación, y la dificultad de obtener estimados poblacionales confiables se ha derivado de la caza furtiva de adultos y pichones en la mayor colonia, más recientemente en Ruth Island, un cayo artificial localizado justo al sur de la anterior Laguna Krause.

Palabras clave: abundancia, caza furtiva, colonias, distribución, Green Cay, Islas Vírgenes de EEUU, Laguna Krause, Paloma Cabeciblanca, *Patagioenas leucocephala*, Ruth Island, St. Croix

Résumé : DISTRIBUTION HISTORIQUE ET ABONDANCE DU PIGEON A COURONNE BLANCHE (*PATAGIOENAS LEUCOCEPHALA*) À ST. CROIX, ILES VIERGES AMÉRICAINES. Une analyse critique des données historiques a été faite sur la distribution des nicheurs et l'abondance du Pigeon à couronne blanche (*Patagioenas leucocephala*) à St. Croix, Iles Vierges Américaines, depuis la première observation de nidification confirmée en 1858 jusqu'en 2001. Cette espèce avait constitué plusieurs colonies de taille moyenne à grande sur 3 sites, 2 îlots (Green Cay, Ruth Island) et un marais de mangrove (l'ancien Krause Lagoon, détruit en 1962). Cependant, seul un de ces 3 sites a toujours été considéré comme étant une colonie active et importante. Le site le plus important connu était Krause Lagoon, où jusqu'à 600 oiseaux nichaient dans les années 1950, bien que la colonie de Green Cay ait pu être encore plus importante dans les années 1910 et 1920. Les données historiques du Pigeon à couronne blanche sont globalement rares à St. Croix en raison d'une pression d'observation insuffisante et la difficulté d'obtention d'estimations fiables des populations est aggravée par le braconnage d'adultes et de poussins sur les sites des colonies les plus importantes, et plus récemment à Ruth Island, un îlot artificiel situé juste au sud de Krause Lagoon.

Mots-clés : abondance, braconnage, colonies, distribution, Green Cay, Iles Vierges Américaines, Krause Lagoon, *Patagioenas leucocephala*, Pigeon à couronne blanche, Ruth Island, St. Croix

THE ABUNDANCE OF THE territorially endangered White-crowned Pigeon (*Patagioenas leucocephala*) breeding population at Krause Lagoon, St. Croix, United States Virgin Islands, before the construction

of a large industrial complex in 1962 destroyed it, has never been documented and critically assessed other than by Dammann (1977) and Arendt *et al.* (1979), whose examination of Seaman's quarterly

federal-aid reports (funded under the Pittman-Robertson Act of 1937) was incomplete. In this note I examine published and unpublished materials, much of the latter from federal-aid reports including all of Seaman's, to obtain estimates of the historical breeding population of the White-crowned Pigeon on St. Croix.

METHODS

Counts or estimates of the number of birds and nests at each historical breeding site were initially taken at face value from the original source. Estimates of the number of birds by Seaman at Krause Lagoon (260 ha) were usually extrapolated from nest counts over a portion of this area. Where warranted, I reinterpret the fragmented and incomplete data and conclusions of Beatty, Seaman, Knowles, and other individuals about the size of breeding populations at various historical sites. These data include the most recent site at Ruth Island, just south of the former Krause Lagoon, which was created by placing dredged spoil taken from channels excavated for the industrial complex on a nearshore bar (Long Reef). Subsequent to vegetative colonization and succession, Ruth Island became the main breeding site for White-crowned Pigeons on St. Croix (Knowles 1994, 1995, 1997). However, data on the abundance of the breeding population at Ruth Island, where this pigeon breeds semi-colonially in dense aggregations (and formerly on Green Cay; Beatty 1930), have also never been critically examined. These historical data form the basis of our knowledge of breeding White-crowned Pigeons on St. Croix prior to initiation of new surveys in 2002 (McNair unpubl. data).

RESULTS

UNKNOWN LOCALITY

The earliest record of breeding White-crowned Pigeons on St. Croix was a juvenile "which could not have left the nest many days" (University Museum of Zoology, Cambridge 17/col/8/w/3) shot on 28 July 1858 by Newton and Newton (1859).

GREEN CAY

Beatty (1944) stated this cay was occupied "by a colony of 10,000 breeding birds [White-crowned Pigeons] from 1916 to 1920" but they have not nested there since that period. He also stated earlier (Beatty 1930) that White-crowned Pigeons nested in "countless numbers" on Green Cay in the early 1920s, when the northern part of this cay had intact

heavy woodland (unlike today, it is now low scrub; Woodbury and Vivaldi 1982). The only documented breeding evidence was two eggs taken from a nest on 21 June 1921 (Beatty 1930). Seaman (1973, 1993) also observed breeding birds at Green Cay during the 1920s, but provides no numbers and it is impossible to separate information on White-crowned Pigeons in his accounts from Zenaida Doves (*Zenaida aurita*). Dammann (1977) stated birds at Green Cay had been shot out since 1946, but presented no data. In the 1980s, Fred W. Sladen (pers. comm.) observed small numbers of White-crowned Pigeons on Green Cay during the main breeding period (May-July), although he found no nests.

SOUTHGATE POND

Seaman (1993) suggested that White-crowned Pigeons were formerly restricted to nesting on St. Croix proper during the 1920s at Southgate Pond, just across from Green Cay (350 m), but no documented evidence exists. Sladen (*in* Scott and Carbonell 1986) stated birds bred at Southgate Pond in the 1980s, but did not discover nests. Breeding habitat would have been in mangrove wetlands and littoral woodland on the beach berm.

KRAUSE LAGOON

Harry A. Beatty was the first individual to document nesting over many years (11 June 1934, 30 May 1939, 3 May 1941, 4 May 1941, and 15 June 1944) when he collected five sets of two eggs (Western Foundation of Vertebrate Zoology 17348, WFVZ 17347, San Bernardino County Museum 2P30, United States National Museum B46833; and Delaware Museum of Natural History 471, respectively). In 1942, Beatty (1943) stated a "large colony" was nesting in the mangroves on 21 July. From 300-600 birds nested at Krause Lagoon in 1944 and through the 1950s (Table 1), usually based on extrapolated estimates from counts of nests that ranged as high as 170 per year. George A. Seaman banded 1,271 squabs from 1950 to 1960 (Table 1). The estimated number of adult birds and number of banded squabs per year ($n = 6$) were positively correlated (Spearman's rank correlation, $r_s = 0.84$, $P = 0.04$), even though the breeding population generally declined during the 1950s, but by no more than half its maximum number in 1950 (*contra* Dammann 1977). Dammann and Nellis (1992) stated that Krause Lagoon was formerly "the home of thousands" of White-crowned Pigeons, but I cannot find any substantiation for this statement.

Table 1. Estimated number of adult birds, minimum number of nests, and number of banded young of the White-crowned Pigeon documented at Krause Lagoon from 1944 to 1961 on St. Croix, U. S. Virgin Islands.

Year	Number of Adults	Number of Nests	Number of Visits	Range of Visits	Number Banded ^a	Reference(s)
1944	500			Jun		Beatty 1944
1949	“half its former size”			May - Jun		Seaman 1949
1950	600	170 ^b	5	12 Jun - Aug	174	Seaman 1950a, b
1951			U ^c	21 Jun - 3 Aug	122	Seaman 1951b
1952				May - Jul	97	BBL ^d
1953		60+	U	Jun - Aug	180	Seaman 1953, 1954b
1954	500 ^e	54+; 19	U	<18 May - 24 Jul; 4 Nov	150	Seaman 1954a, b
1955	45	55+	U	28 Apr - 28 Jul	110	Seaman 1955
1956	350	83+	4+	29 May - 14 Aug	38	Seaman 1956a, b, Lamb 1957
1957	300	83+	3	21 Jun - 26 Jul	54	Seaman 1957b
1958	“few hundred”					Seaman 1958
1959		U	U	late May - 9 Jul	103	Seaman 1959a, b
1960	500			13 May - Sep	243	Seaman 1960
1961		30+	5	25 May - 25 Jul		Seaman 1961

^adata supplied by the Bird Banding Laboratory, Patuxent Wildlife Research Center, U. S. Geological Survey

^bsome of the same nests may have been sampled on different days, although White-crowned Pigeons frequently reuse the same nest

^cunknown

^ddata on range of visits also supplied by the Bird Banding Laboratory

^eabout two-thirds of the birds were breeding, according to Seaman (1954a)

KRAUSE LAGOON REMNANT

Dammann (1977) stated that a “few” birds nested in dead mangroves at Krause Lagoon Remnant, but White-crowned Pigeons do not nest in *dead* mangroves (McNair pers. obs.). Ten birds were at Krause Lagoon Remnant during June 1982 (Norton 1982) and Sladen (*in* Scott and Carbonell 1986) discovered fewer than ten breeding pairs there in the 1980s.

SALT RIVER ESTUARY

Seaman (1993) stated that “hundreds” of White-crowned Pigeons roosted at Salt River Estuary (actually, in Sugar Bay) in the mid-1930s. According to Dammann (1977), the birds had been shot out since 1946. Birds still roosted there in 1950, but Seaman (1950a) did not mention any numbers. Also in 1950, Seaman (1950a, b, 1951a) reported that “a small and negligible colony” nested there, perhaps based on second-hand information. Seaman (1954a)

stated that by 1954 White-crowned Pigeons no longer nested at Sugar Bay. Lamb (1957) stated that Salt River Bay was a former breeding site, apparently based on information provided by Seaman. Sladen (*in* Scott and Carbonell 1986) stated birds nested at Sugar Bay in the 1980s, but did not discover any in mangrove wetlands where he implied they occurred. Wauer (1990) presumed White-crowned Pigeons nested in littoral woodland just above Sugar Bay, not in mangroves, but provided no documentation.

RUTH ISLAND

The first year birds began nesting at Ruth Island, a dredge spoil island created in the early 1960s, is unknown, although they were established by 1980 when Yntema and Sladen (1987) saw an adult sitting on a nest, brooding young. The pigeons breed at Ruth Island in littoral woodland and scrub as well as mangrove wetlands (Yntema and Sladen 1987).

Knowles (1994, 1995) reported that 200-300 pairs of White-crowned Pigeons nested at Ruth Island in 1993. After he established plots beginning in 1994, Knowles (1994, 1995, 1997) estimated that a minimum number of 633, 961, and 899 pairs nested at Ruth Island in 1995, 1996, and 1997, respectively.

OTHER BREEDING SITES

Sladen (*in* Scott and Carbonell 1986; Sladen pers. comm.) discovered from 1-10 breeding pairs at seven other sites in the 1980s, at Altona Lagoon, the Buccaneer Hotel, Coakley Bay Salt Pond, Great Pond, Manning Bay Lagoon, Sandy Point National Wildlife Refuge (NWR), and the University of Virgin Island (UVI) Wetlands. In addition to birds nesting on Ruth Island, Sladen confirmed breeding (nests found, with eggs or young) on at least four of these seven sites (Great Pond, Manning Bay Lagoon, Sandy Point NWR, UVI Wetlands). Breeding pairs at all sites were located in mangrove wetlands including Great Pond, except for additional birds at Great Pond in littoral woodland on the beach berm and at the Buccaneer Hotel where they only nested in littoral woodland.

DISCUSSION

Historical data on the White-crowned Pigeon breeding population on St. Croix are sparse, other than those for the former Krause Lagoon during the 1950s and Ruth Island during the mid-1990s. Birds were formerly concentrated at Green Cay, then Krause Lagoon, where documented breeding populations did not overlap. It is impossible to reconstruct a plausible population estimate for birds on Green Cay (Beatty's claim of 877 pairs/ha, if it had been confirmed, would have been the densest breeding aggregation ever documented; Bancroft and Bowman 2001). Apparently plausible documented population estimates are available for Krause Lagoon, most from the 1950s, when the maximum annual population estimate for this multi-brooded pigeon was 600 birds in 1950 (*contra* Dammann 1977).

Following destruction of the former Krause Lagoon (Norton and Seaman 1985), Ruth Island became the apparent primary breeding site on St. Croix by the 1990s, although it is unknown when birds first began breeding there except that it was sometime between 1962 and 1980. The proximity of uninhabited Ruth Island to the former Krause Lagoon probably facilitated colonization. Knowles overlooked many other breeding sites on St. Croix discovered by Sladen in the 1980s, that were un-

doubtedly active in the 1990s regardless of any effects of heightened hurricane activity on habitat since 1989 (e.g., Wauer and Wunderle 1992, Wiley and Wunderle 1993). These populations were probably small, suggested by the size of recent (2002-2003) breeding populations at all of these sites except for one for which there has been a recent, obvious increase because of favorable habitat change (McNair unpubl. data).

The larger size of the breeding population of White-crowned Pigeons at Ruth Island, however, must not have been nearly as large as Knowles had estimated. His original data were not documented or presented in a form that can be extracted to reanalyze the data, so the size of the breeding population is unknown; it probably did not exceed 150-200 pairs. Knowles's estimates at Ruth Island were approximately 2-3 times greater than the largest estimate of the former breeding population at Krause Lagoon. This is unlikely, even though White-crowned Pigeon nests at Ruth Island can be closely packed in littoral woodland (as they may have been at Green Cay), whereas at Krause Lagoon they were usually spaced widely apart in red mangroves but over a much larger area (260 ha compared to 7.1 ha). Knowles attributed the breeding population crash at Ruth Island in 1994 and low nest success during the other 3 yr to predation, which he rarely observed or documented. However, poaching of squabs occurred regularly at Krause Lagoon, where Seaman on a single visit noted that up to 25% of his marked nests poached, and may better explain Knowles's data. Poaching by squab poachers was diffused here because nests were dispersed, the habitat was tiresome to traverse, and the large size of Krause Lagoon prevented breeding failure from occurring from poaching alone. The smaller size of mangrove wetlands at Salt River Bay may have allowed poachers (of squabs and adults) to wipe out the breeding colony.

Poaching of squabs is an illegal practice that continues today at Ruth Island, where nearly complete breeding failure probably occurred in 2002 because the aggregated, accessible nests on this small island facilitate poaching (McNair unpubl. data). Negligible poaching of adults and juveniles otherwise occurs island-wide, but this was a common practice during Seaman's day even during the breeding season which sometimes coincided with the opening of the hunting season on St. Croix (e.g., 16 August in 1956; 1 July in 1960; Seaman 1957a, 1960; Norton and Seaman 1985). Surviving adults at Green Cay, then later at Krause Lagoon, probably dispersed to

breed at other sites on St. Croix (and perhaps other islands), although this was not documented, as they continued to be reduced by hunting pressure (including poaching), and later, at Krause Lagoon by habitat destruction (Dammann 1977, Norton and Seaman 1985; cf., northern US Virgin Islands: Nichols 1943; British Virgin Islands: Mirecki *et al.* 1977; Puerto Rico: Wiley 1977, 1979, Arendt *et al.* 1979). Hunting pressure may have led to cessation of breeding at Salt River Estuary (= Sugar Bay), assuming breeding occurred, although the apparent population size was small, at least by 1950. The main reason for continued hunting pressure was to kill larger numbers of roosting birds in late summer and early autumn, especially in the mature mangrove forest. The effects of hunting pressure and poaching of squabs on numbers of White-crowned Pigeons, in addition to insufficient documentation or lack of substantiation of claims over many years, makes it difficult to make plausible population estimates at most historical breeding sites. It is also uncertain how many breeding sites were active on St. Croix and how important they were before the elimination of breeding birds from Green Cay by 1930 and before the destruction of Krause Lagoon and after the creation of Ruth Island during the early 1960s. It is perhaps notable, however, that no more than one historical breeding site of moderate or major importance has ever been documented to be active at a given time on St. Croix.

Insufficient observer effort since Seaman's day, especially on St. Croix proper, contributed to uncertainty about historical breeding populations. Enigmatically, Seaman (1993) never saw a White-crowned Pigeon in the western end of St. Croix (including Krause Lagoon) during his childhood, but only saw his first birds at Southgate Pond and Green Cay during the early 1920s because Beatty introduced him to the species there. Much later, Seaman (1993) considered White-crowned Pigeons summer residents of mangrove swamps, yet apparently never searched for the species in littoral woodland (other than Green Cay). Nellis *et al.* (1984) failed to find any breeding sites of the White-crowned Pigeon on St. Croix during the mid-to-late 1970s. Breeding sites in littoral woodland were documented on St. Croix proper (and Ruth Island and Green Cay) in the 1980s when one individual (F. W. Sladen) finally looked for them in this habitat. Insufficient observer effort also extended to mangrove wetlands, even though this breeding habitat is generally preferred by pigeons compared to littoral woodland (except on islands) because anti-

predator adaptations include selection of relatively remote sites and placement of nests directly over water (Wiley 1979, Campbell 1991).

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