

WHITE-CROWNED PIGEON: STATUS RANGEWIDE AND IN THE DOMINICAN REPUBLIC

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Abstract: White-crowned pigeon (*Columba leucocephala*) populations have undergone a widespread decline as a result of habitat destruction and poor (or no) management. The Dominican Republic once had large populations of this pigeon, but our investigations between 1976 and 1978 showed their numbers are now drastically reduced. The pigeons are migratory, using lowland areas for nesting (March through October), and following available food sources through a wide range of habitats during the non-breeding season. Areas of 4 nesting colonies ranged from 16.0 to 40.9 ha and were formed of a dense core with dispersed or solitary nesting birds around the periphery. Numbers of adults in the colonies ranged from 8,000 to 16,800, and nest densities observed were from 0.8 to 3.3 nests/100 m². Human harassment of colonially nesting pigeons was responsible for the failure of most breeding colonies we inspected. To aid recovery of the species in the Dominican Republic we recommend a ban on all white-crowned pigeon hunting during the breeding season to be enforced by trained game agents, as well as the preservation of additional habitat, and continued research on the pigeon's biology.

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Although the white-crowned pigeon remains widely distributed along the Caribbean coast of Central America from Yucatán to northwest Panama, in southern Florida, and throughout most of the West Indies south to St. Lucia, populations have declined considerably. The most important factors in its decline have been habitat destruction and shooting (Wiley 1979). Some authors (e.g., Kraft 1972) have speculated that white-crowned pigeons still occur in tremendous numbers in the Dominican Republic, and that perhaps these populations serve as a reservoir for other depleted populations. Our studies have shown widespread destruction to the Dominican populations leaving little hope for the continued survival of substantial numbers in that country unless immediate conservation programs are undertaken.

Despite its wide distribution and use as a game and food species, until recently (Wiley and Wiley 1979) there has been little reported on white-crowned pigeon biology. It is our purpose here to (1) review recent reports of the species' status rangewide, and (2) to report our observations of white-crowned pigeons in the Dominican Republic.

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METHODS

Our periods of study in the Dominican Republic spanned approximately 3 years. Between December 1975 and July 1976, Wiley studied white-crowned pigeons incidental to his investigations of the Hispaniolan parrot (*Amazona ventralis*). In November 1976 the Smithsonian Institution Environmental Program, in conjunction with the Museo Nacional de Historia Natural of the Dominican Republic, began a study of the white-crowned pigeon with Peace Corps Volunteer Arendt and Dominican biologist Vargas. This study was concluded in October 1978.

Coastal and inland forests throughout the country were surveyed for pigeons. Information on location of breeding colonies was often obtained from hunters, area residents, or Departamento de Caza y Pesca inspectors. All reasonable leads were followed up by a site inspection.

We measured breeding colonies by walking the periphery of the main body of the nesting aggregation. Densities of nests within colonies were sampled by counting all active nests within 100 m² or 400 m² quadrats. These densities were expanded to total area used by the colony to give an estimate of total breeding population.

Total numbers of adult pigeons in colonies were extrapolated from numbers of active nests, and from direct counts of birds as they departed from the colony in the morning or returned in the evening (Wiley 1979). Direct counts actually represented only a fraction of the total colony as white-crowned pigeons follow the typical columbid nest attendance pattern of female on the nest from mid-afternoon through the following morning, and the male on from mid-morning to mid-afternoon. To obtain an estimate of numbers in colonies we used a conservative factor of 1.5 to apply to our direct counts. This factor considered the numbers of females on nests, while females not yet on eggs, or no longer attending older squabs, were assumed to be counted with the males. Counts were made from tree-tops lookouts or from open coastal areas for unobscured views of flights across channels.

Other procedures are as presented by Wiley and Wiley (1979).

RESULTS

Rangewide Status Review

We have summarized recent reports of white-crowned pigeon status throughout its range (Table 1). Here we will discuss changes in major populations. Generally, trends of declining populations predominate, with harvesting and habitat destruction cited as primary causes. Some stability or increases have been reported in populations given protection from shooting.

The once extensive south Florida white-crowned pigeon populations were nearly extirpated by the 1930's through uncontrolled shooting during the breeding season and the taking of squabs from the nests. Since then the pigeon has had complete protection in Florida, and although it has shown substantial recovery, the breeding population remains at no more than 10,000 to 15,000 birds (R. Paul, pers. comm.)

Sizeable breeding populations once occurred in the Bahamas (Bryant 1861, Maynard 1896), Cuba (Gundlach 1874), Hispaniola (Wetmore and Swales 1931, Wetmore and Lincoln 1933), and Jamaica (Gosse 1947, Scott 1892). Unrestricted shooting and squabbing have been identified as the causes of population declines at many traditional breeding colonies in the Bahamas (accounts in Bent 1932), although several large colonies still exist and are now being carefully managed.

TABLE 1. Status of the white-crowned pigeon through its range.

Locality	Status and trend	Factors responsible for decline	Source
South Florida & Florida Keys	Declining until protection of 1930's, presently 10-15,000 birds; stable or increasing	Squabbling, shooting during breeding season	R. Paul (pers. comm.)
Bahamas	declining	shooting, squabbling, habitat destruction	Bent 1932, Blankinship 1975
Cuba & Isle of Pines	possibly declining but still common in some areas	habitat destruction, shooting	Franganillo-Balboa 1941, Garrido & Montaña 1975
Cayman Islands	common		Johnston 1975, Johnston et al. 1971
Jamaica	common local resident; formerly declining, now perhaps increasing since 1974 hunting ban	habitat destruction, shooting	Cruz 1972, Lack 1976, P. Fairbairn & O. Murray (pers. comm.)
Haiti	uncommon; declining	habitat destruction, shooting, squabbling	personal observations
Dominican Republic	common; declining	habitat destruction, shooting, squabbling	Terborgh 1974, R. Cotte (personal communication), personal observations
Puerto Rico	11,000 birds (1974-75); declining	habitat destruction; shooting	Wiley 1979
U.S. Virgin Islands	formerly abundant; now scattered populations	habitat destruction, shooting	Seaman 1955 ¹ , 1962 ² , 1956; Kraft 1972; A. Damman (personal communication)
British Virgin Islands	former breeder, now casual visitor		Mireci et al. 1977
Anguilla	rare, some may still breed		Seaman 1954 ⁴
St. Martin	former breeder, now rare	habitat destruction	Seaman 1954 ⁴
Barbuda	numerous		Bond 1956
Antigua	present in small numbers; increasing since 1975 hunting ban		Seaman 1955 ⁴ , Bond 1956, Holland & Williams 1978
St. Bartholomew, Guadeloupe, Dominica, Martinique, St. Lucia	casual		Bond 1956
Yucatán (Cozumel Island), Belize, Nicaragua	moderately common		Edwards 1972
Honduras	common resident locally; numbers reduced	shooting	Monroe 1968
Panama	fairly common locally		Wetmore 1968, Ridgely 1976

¹Seaman, Quart. Rept., P-R Prot., Virgin Islands Dept. Conserv., 1955, w-4-R-6; ²1962, W-4-R-13; ³1954, W-4-R-6; ⁴1955, W-4-R-7.

Earlier reports (Franganillo Balboa 1941:161) of the white-crowned pigeon in Cuba indicated population declines due to hunting and conversion of habitat to croplands. Recently, Garrido and Garcia Montaña (1975) have reported the species as common in the mountains, coastal forests, and mangroves of Cuba, Isle of Pines, and some offshore keys.

In Jamaica, Cruz (1972) found the white-crowned pigeon to be a common resident in the central Lluidas Vale and P. Fairbairn (pers. comm.) reported this pigeon is now common around well-wooded coastal areas. Lack (1976) described the species as resident in the lowland forest of Jamaica. Since 1974 the white-crowned pigeon has been protected by a complete ban on bird shooting.

The near-complete habitat destruction in Haiti has had a drastic effect on the pigeon (personal observations). Continued clearing of natural forests and shooting for food offer little reason for optimism for the species in this extremely poor and overcrowded country.

The largest populations of white-crowned pigeons are now possibly in the Dominican Republic. From the mid-1930's to the mid-1960's firearms were rigidly controlled by the Trujillo government, but human depredations, notably the use of squabs for human and livestock food, did occur to an unknown extent. Although several major nesting colonies (e.g., San Pedro de Macoris and the northeast coastal breeding populations) have been lost to expanding human populations, little habitat destruction has taken place compared to other islands within the species' range. However, current threats to nesting and feeding habitat, as well as increasing intensities of hunting and continued squabbling (Terborgh 1974, personal observations) are reasons for concern for Dominican pigeon populations.

The pigeon was formerly common and widespread in Puerto Rico (Wiley 1979) but has undergone a substantial decline probably beginning in the 19th century. By the first quarter of this century the species was found in only a few localities. Habitat destruction

and shooting have been cited as the main causes of the pigeon's decline in Puerto Rico. The white-crowned pigeon was given complete protection in 1977 through federal and Commonwealth regulations. Current populations are estimated to total 11,000 birds for Puerto Rico and its possessions.

In the U.S. Virgin Islands the last remnant breeding colony was lost with the destruction of Krause Lagoon in 1962 (Seaman 1959, Kraft 1972).

Because of the precipitous decline of the species in many parts of its range, several governments (e.g., Jamaica, Puerto Rico, Antigua, state of Florida) have given it complete protection until its numbers recover sufficiently to sustain a well managed hunting season.

Distribution in the Dominican Republic

We found white-crowned pigeons in a wide range of forest types in the Dominican Republic: mangroves, wet and dry hardwood forests in limestone karst, and lower montane evergreen forests. Their catholic tastes for habitats are illustrated by the range of life zone types (Holdridge System) used: Dry Subtropical Forest, Subtropical Thorn Woodland, Moist Subtropical Forest, and Wet Subtropical Forest (Ecological Map in Tasaico 1967). Higher elevations (above 2500 m), the pine forests (lack of food species), and areas cut-over for agriculture were not used by the birds.

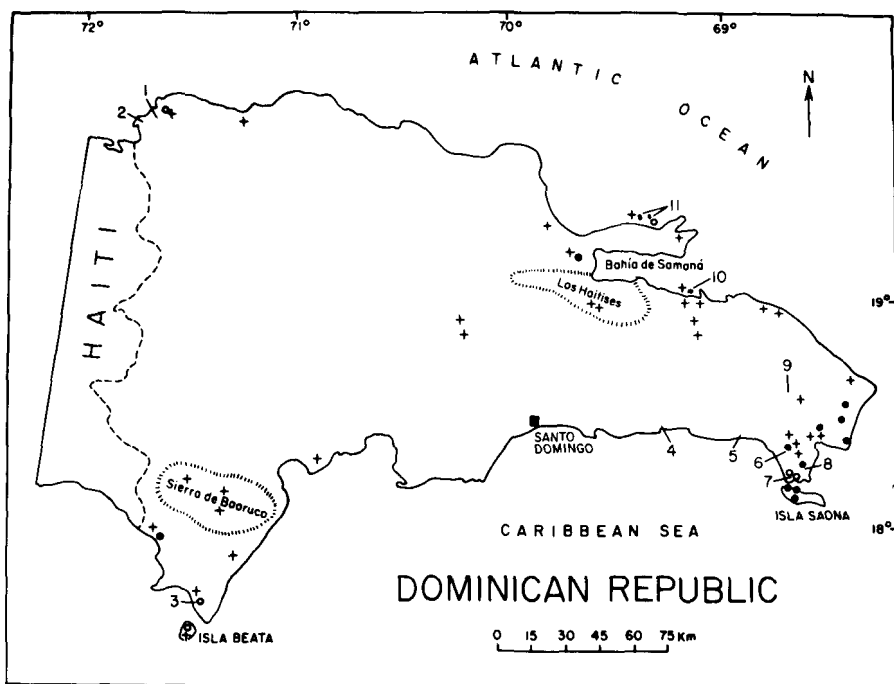


Fig. 1. White-crowned pigeon nesting localities and non-breeding season sightings, Dominican Republic, 1975-1978. Solid circles represent nesting sites, open circles are sites of dispersed or solitary breeding, and crosses are non-breeding season sightings. Numbers represent localities mentioned in text or important to white-crowned pigeons: 1. Laguna Siete Vara, 2. Salina Chica, 3. Bucan de Base, 4. San Pedro de Macoris, 5. La Romana, 6. Las Calderas, 8. Los Rieles, 9. Higüey, 10. Caya de Bocaina, 11. Cayo Limón and Caya Cana.

Populations in the Dominican Republic are migratory, showing a general trend of aggregation in coastal areas during the breeding season (mainly May through September) and post-nesting season dispersion (Fig. 1). Similar movements have been reported for other populations (Table 2).

TABLE 2. Reported white-crowned pigeon seasonal dispersion.

Locality	Season	Description of movement	Source
Bahamas	winter	dispersed in thickly-wooded areas	Cory 1880, Bailey
	summer	gregarious; move to outer keys to breed	(in Bent 1932)
Cuba	winter	disappears almost completely; otherwise seasonally abundant in lowlands	Gundlach 1874
Ile of Pines	late Feb to late Sep	common in flocks	Todd 1916
Florida Keys	winter	most migrate	
	late May or early Jun	arrive	Audubon 1834, Maynard 1896, Howell 1932
	late Oct	depart; movement between Cuba and Florida Keys	
Florida mainland	winter	most migrate	Howell 1932
Puerto Rico	Apr to Sept	coastal breeding	Wiley 1979
	Oct to Mar	most disperse over inland forests	
St. Croix, U.S.	Feb	arrive	Beatty 1930; Seaman 1954 ^a , 1955 ^b , 1955 ^c
	Mar to Apr	scattered	
	May to Jun	coastal breeding colonies	
St. Martin	Oct	depart	
	early summer	arrive	Seaman 1954 ^a
Barbuda	Sep and Oct	depart	
	Feb	begin arriving	Seaman 1954 ^a
Yucatán Peninsula	Sep	depart; some remain year-round	
	Aug and Sep	large numbers	Paynter 1955
	Oct to Jul	absent	

^a and ^b Seaman, G. Quart. Rept., P-R Proj., Virgin Islands Dept. Conserv., 1954^a, W-4-R-6; 1955^b, W-4-R-6, 1955^c, W-4-R-7.

Most non-breeding populations of white-crowned pigeons are widely dispersed, some occurring up to the moderately high altitudes (2300 m) of the interior mountains. These seasonal movements are probably in response to food and cover availability. Pigeons were common in the central Los Haitises range (January to June 1976) and the southwestern Sierra de Baoruco (winter 1977, 1978), where they fed and roosted individually or in pairs. Frequently, we observed white-crowned pigeons foraging with the closely related scaly-naped pigeon (*C. squamosa*).

All records of breeding were from areas below 75 m. Breeding colonies usually began to form in late spring (early May 1976, late May 1977) which coincides with the onset of the rainy season (Montanari 1967), although in 1978 the first known colony did not form until mid-July despite normal rain patterns. The numbers of birds in the colonies continue to increase for several weeks due to immigration, resulting in asynchronous breeding stages within the aggregation.

Pigeon banding efforts have been limited in the Dominican Republic. In 1972 R. Cotte (U.S. Fish and Wildlife Service) and game agents of the Dominican Departamento de Caza y Pesca, aided by local residents, banded 500 pigeons on Isla Saona. In 1977 Arendt and Vargas banded 42 white-crowned pigeons on that island. Recoveries from these efforts show wide-ranging intra-island movements (Fig. 2).

Inter-island movements of the Dominican population are known from Dominican recoveries of birds banded in the Bahamas (U.S. Bird Banding Laboratory records), and

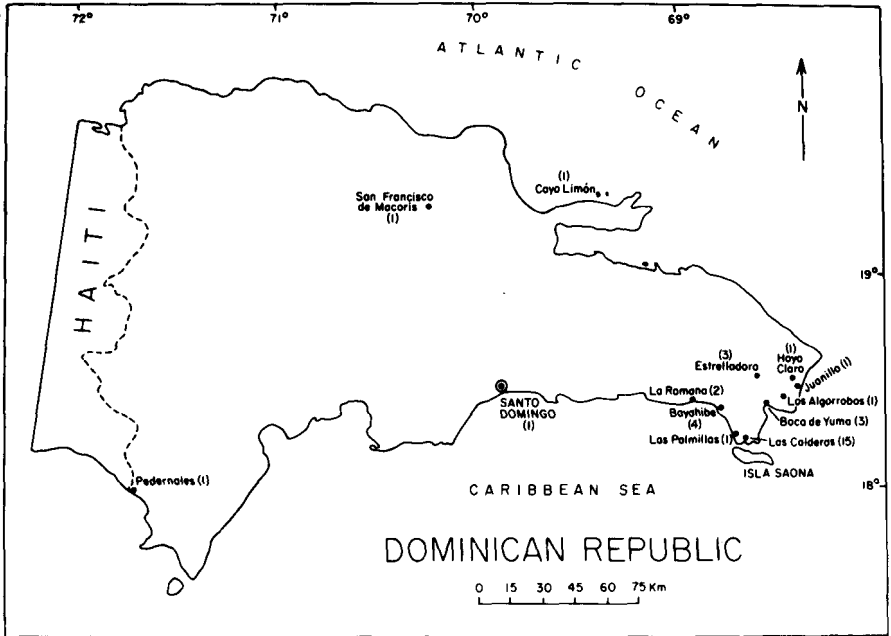


Fig. 2. Recoveries of white-crowned pigeons banded on Isla Saona, Dominican Republic. The number in parenthesis adjacent to a site represents the number of pigeons recovered there.

observations of flights between the Dominican Republic and Isla Mona, Puerto Rico (Barnes 1946; Wiley 1979; C. Kepler, pers. comm.).

Daily movement patterns vary with season and habitat. Pigeons breeding or roosting in mangroves or small offshore islands show regular morning and evening flights to inland forests for food and water. White-crowned pigeons breeding inland also showed morning and evening flights as they departed from the food-depleted nesting areas for feeding and watering sites. Mean departure time of pigeons from colonies was 25 min before sunrise (range = 31 min before to 44 min after sunrise; $n = 4$). Mean arrival was 65 min before sunset (range = 229 min before to 3 min after sunset; $n = 8$). Inclement weather delayed departure from the colony.

In contrast, non-breeding birds wintering alone or in pairs at higher elevations were not observed making long-range flights, but fed and roosted where they were.

Breeding in the Dominican Republic

The majority of white-crowned pigeons breed between May and September, although we found individuals or small groups nesting as early as March or as late as October (Table 3).

Areas of four breeding colonies ranged from 16.0 to 40.9 ha (Table 4). A colony of 161 nesting pairs was located on several closely-spaced mangrove keys (north coast of Isla Saona) which formed an aggregate of 0.5 ha. Numbers of breeding birds within the colonies ranged from 8,000 to 16,800 (Table 4). Colonies were typically formed of a denser core of nests with internest distances increasing about the periphery until they were quite dispersed or solitary.

Our observations of inland nesting colonies did not show trees weighed down with multiple nests as was often described to us by residents or has been recorded for past

TABLE 3. White-crowned pigeon breeding chronology in the Dominican Republic, 1976-1978.

Locality	Stage of breeding activity	Dates
Los Rieles	nest building, eggs	30 Jun-6 Jul 1977
Isla Saona No. 1	colony formation, nest building	11-15 Jun 1976
Isla Saona No. 2	nest building, egg laying	15-21 Jul 1977
Isla Saona No. 3	nest building, eggs	9 Sep 1977
Isla Saona No. 4	eggs, squabs	10-13 Sep 1977
Isla Saona No. 5	eggs, squab (1 nest)	30 Aug 1978
Isla Beata	eggs, squabs	26-30 Jul 1977
Salina Chica	nest building (3 nests)	16 Mar 1977
Laguna Siete Vara	eggs (1 nest)	16 Mar 1977
Bucán de Base	eggs, squabs	1 Aug 1977
Las Calderas No. 1	squabs	2 Oct 1977
Las Calderas No. 2	eggs, squabs (13 nests)	29 Aug 1978
Las Calderas No. 3	eggs (1 nests)	7 Sep 1978
La Cueva de Luis	nest building, eggs	"latter part of May" 1977 ^a
Samaná Bay	nest building, eggs	19 May 1977
Samaná Peninsula (Caya La Cana)	eggs, squabs	9 Jul 1978
Roman	nest building, eggs, squabs	21-23 Jul 1978

^areliable interview

populations. Within colonies we found densities of from 0.8 to 3.3 nests/100 m² (Table 4). Mean nearest neighbor distances at 4 colonies were: Los Rieles, 4.4 m ($r = 1.1-13.2$ m, $n = 18$); Román, 4.5 m ($r = 1.0-9.5$ m, $n = 100$); Isla Saona no. 2, 6.5 m ($r = 1.7-9.8$ m, $n = 36$); and Isla Saona no. 3, 2.6 m ($r = 3.5-5.5$ m, $n = 159$).

White-crowned pigeons nested in mangrove forests composed of black mangrove (*Avicennia germinans*), red mangrove (*Rhizophora mangle*), white mangrove (*Laguncularia racemosa*), and button mangrove (*Conocarpus erectus*). Nests were located in all mangrove species. We sampled trees ($n = 99$) used by nesting white-crowned pigeons at the Román colony (an inland area). The most-often used species were copeyejo (*Clusia minor*) (13 nests), red manjack (*Cordia collococca*) (13), black-cherry (*Eugenia monticola*) (12), false-mastic (*Sideroxylon foetidissimum*) (11), wild-mammee (*Clusia rosea*) (9), and azota criollo (*Rachicallis americana*) (9). On Isla Saona, the July 1977 inland colony used 11 tree species for nesting, the most common being *Cordia diversifolia*, *Metopium toxiferum*, and *Clusia rosea*. On Isla Beata we found pigeons nesting in pock-holes on 6m high coastal cliffs facing to windward.

Clutch size was determined at the north coast Isla Saona mangrove key colony (no. 4): mean clutch was 1.71 ± 0.62 (range 1-5 eggs/nest; $n = 163$). The nests with 4 and 5 eggs (1 nest with each) most likely had contributions by 2 females. Eggs averaged 35.31×26.31 mm ($n = 199$; ranges: length, 32.0-39.8 mm; width, 24.1-28.9 mm).

TABLE 4. Area, population characteristics, and nesting densities of white-crowned pigeon nesting colonies in the Dominican Republic, 1976-1978.

Site	Dates	Dimensions	Colony area			Number of active nests			Number of adult pigeons	
			Total area	Nature of area measured	Sample characteristics	Area	Nest density	Number	Survey method	
Los Rieles	6-8 Jul 1977	560 x 600 m	336,000 m ² (33.6 ha)	core	6 x 10 m ² plots in areas of high and low nest concentrations; 2 empty plots and 4 occupied plots. 17 nests (range 1-7 nests occupied plot)	2.8 nests/100 m ² , 4.3 nests/100 m ² , range 9,400-14,450 nests	14,300	quadrats		
Isla Saona No. 1	11-15 Jun 1976	700 x 300 m	210,000 m ² (21.0 ha)	core	12 x 400 m ² plots; 2 empty plots and 10 occupied plots; 36 nests (range 1-6 nests occupied plot)	0.8 nests/100 m ² , 0.9 nests/100 m ² , range 3,270-3,630 nests	16,800	direct counts		
Isla Saona No. 2	15-21 Jul 1977	620 x 660 m	409,200 m ² (40.9 ha)	core	7 mangrove islets; range 30 m ² to 3,800 m ²	161 nests/100 m ² , 3.28 nests/100 m ²	8,200	quadrats		
Isla Saona No. 3	10-13 Sep 1977	400 x 400 m	160,000 m ² (16.0 ha)	core	8 x 400 m ² plots	1.7 nests/100 m ² , 2,700 nests	8,000	quadrats and direct count x 1.5 ^a		
Román	21-23 Jul 1978	400 x 400 m	160,000 m ² (16.0 ha)	core	7 mangrove cays (total area 4,902 m ²)	161 nests/100 m ² , 3.28 nests/100 m ²	322	direct nest count		
Somana Bay	29 May 1977						8,500	direct counts x 1.5 ^d		

^aEmpty plots included

^bIncluded only active plots

^cAll nests counted

^dSee text for explanation of use of factor for estimating numbers of birds attending nests while other adult forages.

Human Harassment of Nesting Pigeons

Our attempts to study white-crowned pigeons were invariably thwarted by hunters disrupting colonies. Despite the relatively large expanses of natural forest in the Dominican Republic and the seemingly remote sites chosen by nesting pigeons, we were amazed by the rapidity with which news of the arrival of pigeons in any area traveled to hunters. More often than not we reached sites after the colony had been shot up and any surviving birds had left the vicinity.

Tremendous numbers of white-crowned pigeons concentrating in an area and providing regular flight shooting have great attraction to hunters. The numbers of birds shot from flight lanes, on nests, or as they circle the colony in attempts to return to their nests are appalling. Pigeon colonies on offshore islands are particularly vulnerable to decimation as the adults must make morning and evening flights to and from the mainland over the open channels. Hunters in boats are able to harvest the birds easily as they make the crossing (Kraft 1972).

Most of the birds we observed killed were shot solely for "sport", although pigeon breeding colonies do supply the few local residents with an abundant source of protein, and squabs are harvested in great quantities (e.g., Isla Saona, a national park) to feed to pigs.

With this harassment a colony deserted an area and possibly reformed at another site. In Fig. 3 we present our hypothesis for movements of hunter-supplanted pigeon colonies in the southeast during 1977. Comparable movements are suggested to explain observed colony location shifts in 1976 and 1978. An alternative possibility is that each of these attempts represents different individuals and that with the disturbances the birds disbanded giving up colonial breeding for that year, or dispersed to breed solitarily. However, we believe the scenario shown in Fig. 3 represents a likely interpretation of the events for the following reasons: (1) each of the colonial breeding attempts occurred in a temporal sequence, (2) a spatial sequence (southerly shift) was observed, and (3) no reports of other sizeable colonies were received suggesting that only 1 population was being displaced southward as each attempt at colonial breeding failed.

Although protection had been attempted several times for short periods during the pigeon's breeding season, these measures were erratically imposed and, for the most part, ineffective. The closed season was not instated until the Departamento de Caza y Pesca was informed by its field agents that the first colony had begun forming. By that time hunters had also learned of its formation, entered the area, and destroyed that nesting attempt. Protection policies also varied with the year-to-year political atmosphere: some years no protection was given to the pigeons. In 1977, however, a long term white-crowned pigeon hunting ban was established throughout the Dominican Republic.

DISCUSSION

The white-crowned pigeon populations of the Dominican Republic, despite the still expansive tracts of virgin coastal and inland forests, are no longer as substantial as anticipated. The populations are undoubtedly rapidly declining with the excessive shooting, most of which occurs during the pigeon's breeding season. Until recently restrictions against firearm use in the country probably allowed large populations of this species to survive, although other forms of harvesting (eggs and squabs) must have had a considerable limiting effect.

We make the following recommendations to insure the conservation of the white-crowned pigeon in the Dominican Republic:

- (1). A ban on all pigeon hunting during the breeding season (April through October).
- (2). Regulations to limit bags of pigeons taken during the non-breeding season.

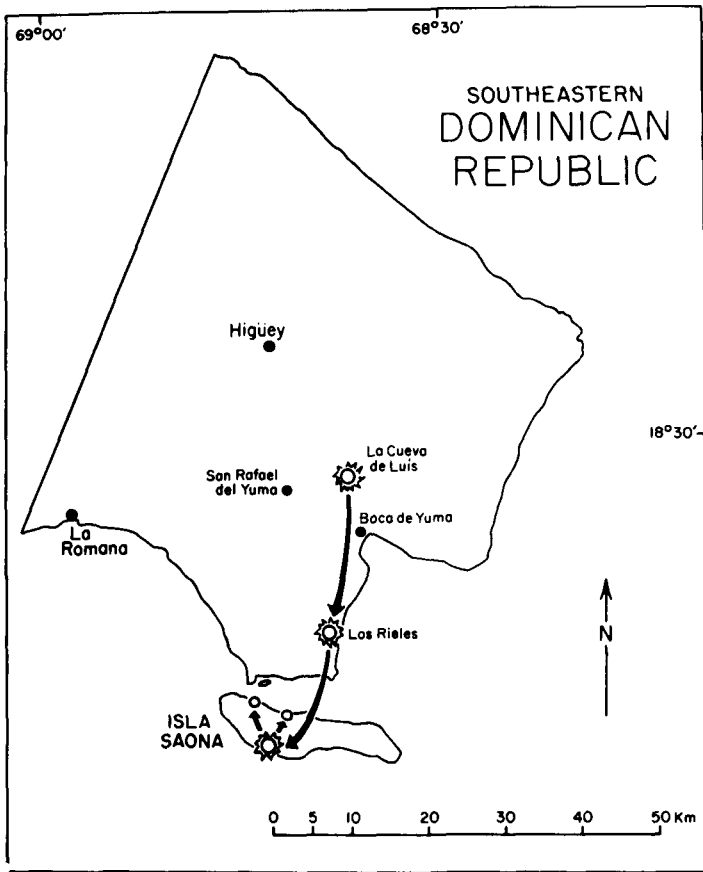


Fig. 3. Probable movement of white-crowned pigeon nesting colony in southeastern Dominican Republic, 1977. The first colony formed at La Cueva de Luis in May. Hunter molestation caused the birds to leave, probably reforming at Los Rieles in June. This colony was disturbed by shooting and the birds next aggregated near Mano Juan, Isla Saona, in July. Further disturbances resulted in the birds once again shifting their breeding site, this time splitting into two smaller colonies on the north coast of Isla Saona.

(3). Enforcement of laws and regulations through professional game agents trained in wildlife identification and management.

(4). Protection of feeding, roosting, and nesting habitats. While we commend the government of the Dominican Republic for its foresight in setting aside such important areas as Isla Saona and Parque del Este as national parks we urge the preservation of other areas still in original forests and important to the white-crowned pigeon (e.g., Barahona Peninsula, southeast dry forest).

(5). Continued research on the white-crowned pigeon.

We feel that with such efforts the white-crowned pigeon will be able to recover. There can be substantial benefits to the people of the Dominican Republic in the recovery of this species. It can continue to be harvested indefinitely at a reasonable rate with proper

management, thus providing a much needed protein source. A tourists industry has already developed around pigeon shooting. This industry could be further expanded coupled with a sound conservation program. Two recently-established national parks owe much of their attraction to the spectacle of the white-crowned pigeon colonies. Development of these parks as tourist attractions could exploit non-consumptive uses of the pigeon; e.g., boat tours to watch the thousands of birds in channel crossings, observation towers overlooking a nesting colony. Without immediate consideration for the management of the white-crowned pigeon there can be no doubt that none of these possibilities will be realized, not to mention the tragic loss of an opportunity to restore the species to the numbers that once so thrilled naturalists.

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