

POPULATION ESTIMATES FOR THE BAHAMA PARROT ON ABACO ISLAND, BAHAMAS

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Abstract.—As part of a long-term study of the biology of the endangered Bahama Parrot (*Amazona leucocephala bahamensis*) on Abaco, population counts were made during the nonbreeding season to estimate the size and stability of this population. As parrots on Abaco roosted communally at night and dispersed from/to roosts in flocks, survey counts were made at roosts and along flight paths to roosts. Between 1986 and 1989, three population counts have been conducted. The only previous census of the Abaco population was done in 1976 and the total population was estimated to be between a minimum of 450 parrots and a loosely defined maximum of 650–800 parrots. In 1989, a minimum of 830 to a maximum of 1082 parrots were counted on southern Abaco. Present threats to this population include nest predation by feral cats, poaching and unprotected habitat.

ESTIMACIONES DE LA POBLACION DE EL AMAZONA LEUCOCEPHALA BAHAMENSIS EN LA ISLA ABACO

Sinopsis.—Como parte del largo estudio realizado sobre la biología del Loro Bahama (*Amazona leucocephala bahamensis*) en Abaco, tabulaciones de la población fueron hechas durante el período en el cual no hay cortejamiento ni reproducción, y de esta manera lograr estimar la cantidad y la estabilidad de la población. Conociendo que los loros en Abaco enidan en grupo durante la noche, y luego se dispersan desde y hacia el nido en bandadas, el conteo fue realizado en los nidos y a lo largo de las vías de vuelo, que los mismos siguen hacia los nidos. Durante 1986 y 1989, tabulaciones de tres poblaciones fueron conducidas. El único censo realizado anteriormente fue hecho en 1976, donde la población total fue estimada a encontrarse entre un mínimo de 450 loros, y un máximo número aproximado entre 650 y 800 loros. En 1989, cerca de 830 loros fueron contabilizados como un nuevo mínimo, mientras que 1082 loros fueron tabulados como máximo en el Sur de Abaco. Entre las presentes amenazas que están afectando esta población se incluyen la predación de los nidos por parte de felinos salvajes, los cazadores y traficantes de especies, y el habitat desprotejido.

The Cuban Amazon (*Amazona leucocephala*) is a polytypic species with five recognized subspecies: *leucocephala* (Cuba), *palmarum* (Western Cuba and Isla de la Juventud), *caymanensis* (Grand Cayman), *hesterna* (Cayman Brac), and *bahamensis* (Bahamas) (Bond 1956). Historically, the Bahama Parrot (*A. l. bahamensis*) was recorded from Abaco, New Providence, San Salvador, Long Island, Crooked Island, Acklins and Great

Inagua (Bond 1956). Today, this subspecies is regarded as rare (King 1977) and is restricted to two islands, Abaco and Great Inagua.

The Abaco population of the Bahama Parrot is the northernmost native breeding population of any species of the genus *Amazona* (Snyder et al. 1982). This population is centered in the mixed broadleaf coppice (thickets of native evergreen hardwoods) and pine (*Pinus caribaea*) areas of southern Abaco. In recent years, the Abaco population has declined as a result of habitat destruction from logging activities and hurricanes, and from hunting pressures (Attrill 1981, Snyder et al. 1982).

Unlike the Bahama Parrots on Great Inagua, which nest in tree cavities, parrots on Abaco nest in natural limestone solution cavities in the ground. The subterranean nesting habit of the Abaco population is unique among the 138 species of New World parrots (Forshaw 1989, King et al. 1979, Snyder et al. 1982).

In 1986 we began a long-term study of the biology of the Bahama Parrot on Abaco. The overall objective of the project has been to develop a sound biological understanding of this subspecies upon which an effective conservation program can be based.

Since 1986, we have conducted three population counts during the nonbreeding season to estimate the size of the population and its relative stability. The only previous survey of the Abaco population of the Bahama Parrot was done in 1976 by Snyder et al. (1982). They estimated the total population to be between a minimum of 450 birds and a loosely defined maximum of 650–800 birds.

METHODS

Our three population estimates were based on fieldwork on 21–29 January 1986, 5–28 January 1988 and 5–31 January 1989. R. Gnam also made a trip to Abaco in January 1987 but a population survey was impossible because of widespread forest fires on southern Abaco. Our methodology followed that of Snyder et al. (1982) in which they derived population estimates from roost counts, so that past and present counts would be comparable. Local residents assisted with some counts. Our most comprehensive population count was made in 1989 and was aided by the field participation of a crew of Operation Raleigh volunteers.

As parrots on Abaco roosted communally at night and moved to and from roosts in flocks, survey counts were made at roosts and along flight paths to roosts. Parrots roosted along the inner edge of the coppice bordering on pine forests and in inland “coppice islands,” which occur in pine yards where coppice vegetation replaces pine as a result of succession and poor pine regeneration after past logging activities. We conducted surveys in the region south of Crossing Rock to Hole in the Wall lighthouse (Fig. 1).

We divided southern Abaco into five zones for survey counts (Fig. 1). These zones are centers of parrot activity and their boundaries are loosely defined. Local hunters commonly divide southern Abaco into the parrot

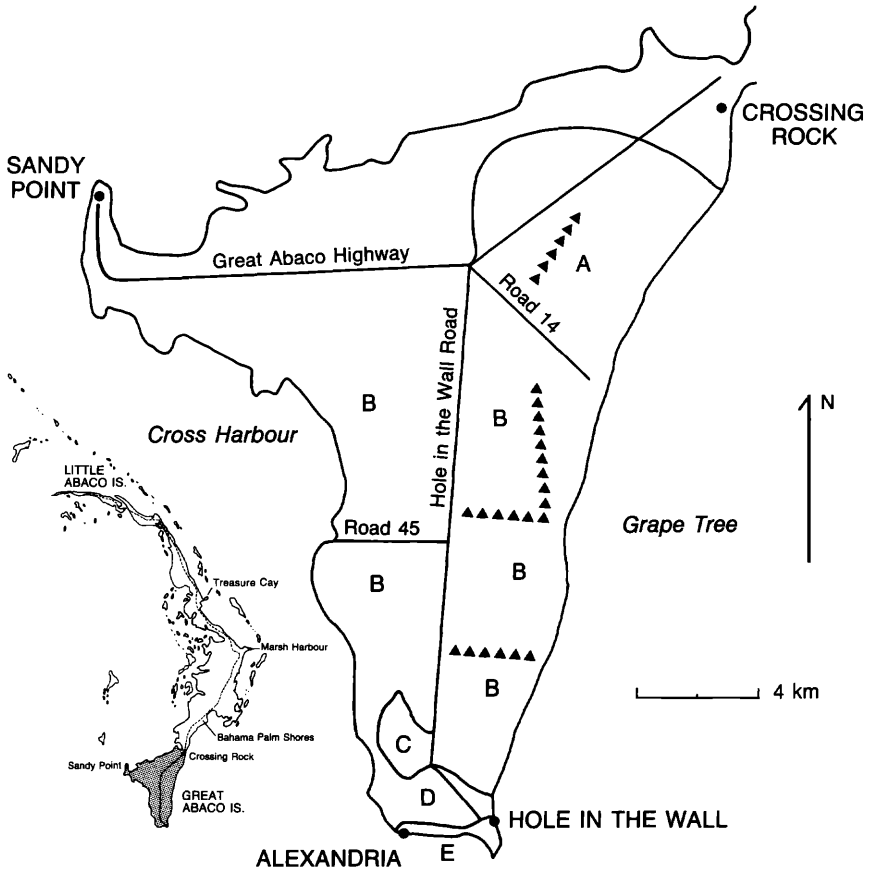


FIGURE 1. Areas of southern Abaco Island, Bahamas that were surveyed for Bahama Parrots (*Amazona leucocephala bahamensis*). Limestone ridges which can reach a maximum elevation of 37 m are indicated by triangles.

area north of road 14, which is an old logging road (Zone A), and the area south of road 14 (Zone B). Both Zones A and B contain parrot nesting areas and have large tracts of pine with coppice borders. Gnam (unpublished) has noted a difference in the vocalizations between breeding pairs in Zone A and B. Zone C is commonly referred to as the “Cocoplum” Area and is characterized by a vegetative understory adapted to freshwater swamp conditions. Besides pine, Zone C has a high density of Pond Top Palms (*Sabal palmetto*) and Cocoplum (*Chrysobalanus icaco*). Zone D contains sparse pine yards and has large tracts of dense coppice scrub. The small xeric scrub area around Hole in the Wall comprises Zone E.

Observers were positioned along the old logging roads, which divide the island into a grid system, and were positioned at about 1.6-km intervals

because flying and vocalizing parrots are detectable up to approximately 0.8 km (Snyder et al. 1982). At each station, observers recorded the number of parrots seen or heard, the direction of their flight and the time of their detection. It is generally difficult to count parrots in groups larger than 10–15 individuals because they mill around in a confusing fashion and birds often repeatedly enter or leave roosts (Snyder et al. 1987). Therefore, observers counted a minimum (subtracted any birds possibly seen more than once) to a maximum (all birds counted) number of parrots in a flock or at a roost. On successive days we progressively surveyed the entire pine-coppice interface of southern Abaco. In addition, inland areas of parrot activity and possible inland roost locations were assessed by vehicle surveys in the early morning and late evening. Areas where parrots were seen or heard were later worked with ground observers.

In those areas where the terrain and paucity of roads made counts difficult, we cut foot paths for better access or observed from treetops. The area between Alexandria and Hole in the Wall lighthouse was impenetrable because of dense coppice scrub. Here, rough population counts were made by counting the numbers of vocalizing birds.

Counts were conducted from first light to 0830 hours and from 1600 hours until dark. These hours corresponded with peak travel periods from/to roosts and activity within roosts. Duplicate sightings of parrots by different observers were eliminated by comparing flight directions and times between adjacent stations. When one roost was observed from different directions, the total count was the sum of the counts for each direction. Whenever possible, roosts with counts greater than 50 were resurveyed during the population counts and an average count derived. Stations were resurveyed when poor weather conditions, such as heavy rains, resulted in reduced visibility and flock movements.

RESULTS

From counts that were made at the same stations ($N = 20$) used by Snyder et al. (1982) in 1976, we made an initial estimate of 304–398 birds for southern Abaco in 1986 (Table 1). Snyder et al. (1982) counted 240–276 birds at these stations (Table 1). However, this estimate assumed that very few birds roost inland (centrally) and that a census of only the pine-coppice interface border adequately estimated population size. As a result of our discovery of a substantial inland roost in Zone A in 1986 (Table 1) and observations of roosting behavior in the breeding season, we expanded our methodology in 1988 to include inland roost surveys. As a result of this change, we counted a minimum of 1089 birds to a maximum of 1317 birds in 1988 (Table 1). In 1989, these same stations were surveyed and population estimates ranged from 830 to 1082 birds (Table 1).

Bahama Parrot populations were largely concentrated in Zones A and B, with small populations elsewhere (Table 1). Parrot nesting areas are located in both these areas (Gnam 1988). From observations, we deter-

TABLE 1. Minimum-maximum Bahama Parrot (*Amazona leucocephala bahamensis*) population counts from Abaco Island, Bahamas.

Area	Year			
	1976 ¹	1986	1988	1989
Southern Abaco	325-375 ^E			
Zone A				
Coppice-Pine Margin	66-81	168-209	132-139	92
Inland	NS	48-60	413-542	239-338
Zone B				
Coppice-Pine Margin	97-103	16-31	46	95-125
Inland	1	NS	312-395	314-427
Zone C	63-75	43-69	60+	65-75
Zone D	14-16	29	126-135	0
Zone E	NS	NS	NS	25
Central Abaco	100 ^E	0	0	30-60 ²
Marsh Harbour/North Abaco		0	0	0
Total	450-800 ^E	304-398	1089-1317	860-1142

¹ Snyder et al. (1982), Snyder (pers. comm.).

² Chambers (pers. comm.).

^E = Estimated count.

NS = Area not surveyed.

mined that inland roosts in Zone A are likely to be occupied in succeeding years.

Local hunters have often reported seeing a flock of 300+ parrots in Zone B between ridges in the area. In 1988, we spent considerable time in this area and counted a large roosting flock of 250-300 birds (Table 1). This flock did not use the same roost nightly but moved the roost within a prescribed inland area of about 8 km². In 1989, we located a flock of 152-222 birds, 4.5 km south of the 1988 station.

Between January 1988 and January 1989, the parrot population in Zone A declined by 224-251 birds (Table 1). Unlike the decline of parrots in Zone D, which may have represented our failure to locate the roost in this impenetrable scrub or movement of the birds into Zone B, we believe the decline in Zone A to be a true loss. Despite increased observers, repeated counts in the area and attempts to locate new parrot roosts in the western area of Zone A, we were unable to find additional birds in this region.

Most Bahama Parrots are restricted to southern Abaco where we conducted our surveys. However, we received reports of a few Bahama Parrots living in and north of Marsh Harbour (Fig. 1). These may have been largely escaped pet psittacines of various species. There have been a few reliable sightings of a flock in the central portion of the island between Crossing Rock and Bahama Palm Shores (Fig. 1). We made an effort to locate this flock, but with no success. From reports given to us by local

residents (C. Boyles and G. Chambers, pers. comm.), we estimated this population to number 30–60 birds. Thus, we estimate the total Bahama Parrot population on Abaco in the late 1980's to have ranged from a well-defined minimum of 860–1142 individuals (actual birds counted) to a less well-defined maximum of about 1300 individuals. We derive this maximum by taking the number of birds counted and adjusting this number for the possible existence of a flock in Zone D.

How closely this estimate of population size approached the true population size is dependent upon how completely we located the parrot roosts of southern Abaco. Our efforts were thorough enough that we doubt if we missed any major concentrations of parrots. In any case, we are quite confident that at least 860 parrots existed in the wild on Abaco during the 1980s.

DISCUSSION

Because we did not monitor all stations simultaneously during our counts, it is possible that some error in counts may have been produced by birds moving between roosts in successive days. However, replicate counts at given roosts have given quite consistent results, so we doubt such movements were normally taking place.

Since the initial census of Snyder et al. (1982), actual counts of the Bahama Parrot population on southern Abaco increased from a minimum of 325 birds in 1976 to an absolute minimum of 830 birds in 1989. However, the large number of parrots that we found roosting inland were not assessed by Snyder et al. (1982). To arrive at long-term trends we should only compare areas censused in both time periods. Although parrot roosting behavior may have changed between 1976 and 1986, our 1986 counts of the pine-coppice border interface stations covered by Snyder et al. (1982) yielded 256–338 parrots, which was very similar to their count of 240–276 parrots. For the same stations in 1988 and 1989 total counts were 364–380 and 252–292. These comparisons suggest: (1) an increase of the population from 1976 to 1988, (2) a decrease from 1988 to 1989, and (3) a relative stability overall for the 14-yr period.

Parrot numbers in Zone A declined dramatically from 1988 to 1989, which may reflect, in part, the poor nesting season that parrots experienced in 1988. In 1988, Bahama Parrots on Abaco exhibited the lowest reproductive rate observed in 4 yr of study, with only 29% of nests fledging young. The number of young fledged per egg-laying pair was 0.60 and per successful pair was 2.0 (Gnam 1990). The cause of this poor reproductive performance was increased nest predation by feral cats, which was responsible for 45% of all nest failures (Gnam 1990).

The introduction of cats to islands has resulted in the eradication of many bird species in the Galapagos (Cruz and Cruz 1987), Marion Island (Van Aarde 1984) and New Zealand (Veitch 1985). Because of their ground-nesting habit, incubating Bahama Parrots are extremely vulnerable to predation by feral cats. In 1988, the nesting female was killed in 50% and injured in 14% of the 14 known attacks (Gnam 1990). Nest

predation by feral cats thus affects the Bahama Parrot population in two ways, poor recruitment as a result of low nesting success and loss of breeding adult females, which can affect the future reproductive potential of the population. Some means of reducing the impacts of feral cats is urgently needed for southern Abaco.

Parrots in Zone A may also have declined for other unknown reasons, such as increased mortality in the nonbreeding season and dispersion of birds from this zone into other zones. Annual adult mortality is presently unknown. Future radiotelemetry studies are planned to examine post-fledging survivorship and flock movements.

With the exception of a small parrot flock in central Abaco, the Bahama Parrot population of the late 1980's was restricted to southern Abaco (an area of 275 km²) and numbered 830–1082 birds. Although the Bahama Parrot population on Great Inagua is assumed to be larger than that of Abaco, reliable data are lacking (Snyder et al. 1982). Population estimates for other subspecies of the Cuban Parrot are higher. The nominate form, *A. l. leucocephala*, numbers about 5000 birds (H. Gonzalez, pers. comm.) and *A. l. caymanensis* numbered 1351 birds in 1985 (Bradley 1986). However, this estimate was made before Hurricane Gilbert struck in 1988 and present numbers may be lower. The subspecies *A. l. hesterna* on Cayman Brac remains the most critically endangered subspecies. Bradley (1986) estimated the wild population in 1985 to be only 39 birds.

Although the Bahamian Department of Lands and Surveys (Forestry Section) has proposed the creation of a 6880-ha parrot reserve as part of a larger 27,519-ha forest reserve for southern Abaco (J. Hook, pers. comm.), legislative approval has not yet been achieved, and the habitat of the Bahama Parrot on Abaco presently remains unprotected. Unless a long-term conservation management plan for this parrot is implemented soon, the future survival of this parrot is questionable (Gnam 1990). The Puerto Rican Parrot (*Amazona vittata*) population numbered 200 birds in 1953, but without conservation measures precipitously declined to 24 birds in 1968 when a recovery plan was initiated at considerable expense (Snyder et al. 1987). Conservation measures for Bahama Parrots that begin now would likely yield better results and be more cost effective. Too often, conservation efforts begin only when populations have declined to such low levels that they may no longer be genetically or ecologically viable (Soulé 1987).

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